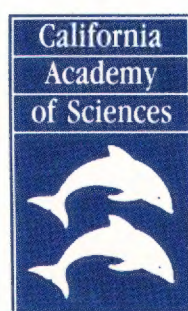

CALIFORNIA ACADEMY *of* SCIENCES



1985-1986 ANNUAL REPORT

CALIFORNIA ACADEMY OF SCIENCES

Golden Gate Park, San Francisco, California 94118

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MESSAGE FROM THE CHAIRMAN

THIS YEAR the Academy's Trustees have been especially active during a time of great excitement and impact on the future of the museum. We are lucky to have such an active board with such varied backgrounds. We have sponsored studies of the strengths and weaknesses of the museum, projections of long-range needs, analyses of membership, and explorations of the role of museums in cultural and scientific communities locally, regionally, and nationwide. The conclusions have been challenging and inspiring, enabling the Board to crystallize its understanding of the museum's long-range philosophy.

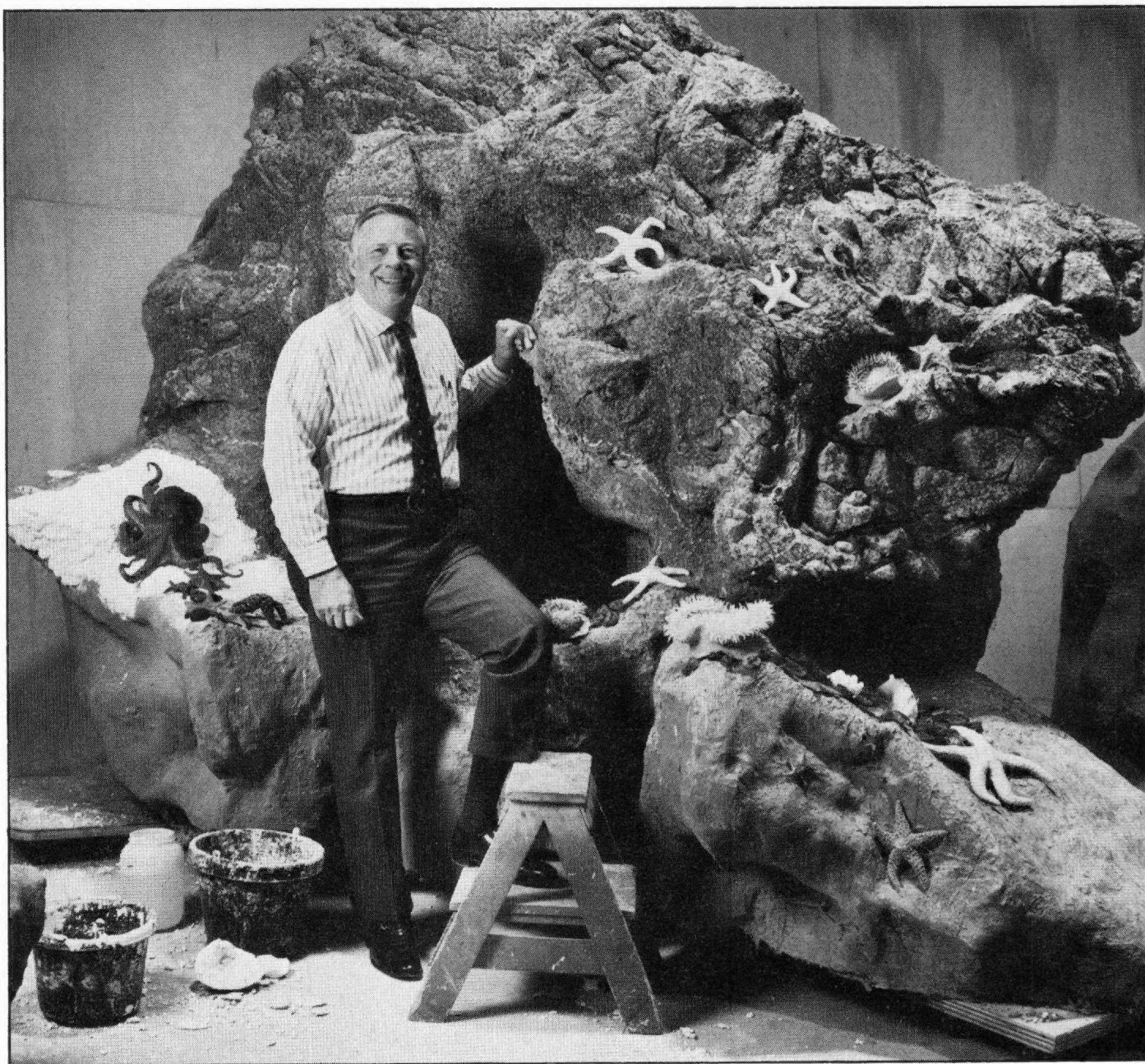
Further, we have worked closely with representatives in the California state government to develop state-level support for museum improvements. For the first time in one hundred and thirty-three years these efforts have been successful. (See the Director's Report for more on these developments.)

Acutely aware of the museum's importance to the city of San Francisco, we have also striven to understand community concerns about Academy development plans and to broaden community support for and awareness of the Academy and the importance of its mission via emissaries to community groups. Uniformly, our museum improvement ideas have been met with positive and responsible interest.

This year we have watched with excitement and amazement as broad museum philosophies were translated by staff into refined plans for phase one of the Academy's exhibit development program—especially the brilliant new halls *Life Through Time* and *Wild California*. (See, for more information, the "On Display" profiles in this report.)

How will we finance these major undertakings? The program requires a range of rigorous, ongoing development activities—activities that are yielding spectacular results. So far we have raised more than \$10 million. These funds have come from Trustees and Honorary Trustees and from the numerous, and generous, Friends of the Academy.

Following Mr. Rudolph Peterson's clear path as chairman, I have devoted myself to the museum's development program. Certainly, we have our work cut out for us. As part of this crucial effort, Mr. Peterson has taken over chairmanship of the advisory committee and also serves on the executive committee ex officio. His unflagging interest and support of the Academy continue to motivate and inspire his fellow Trustees.



Susan Middleton

Dr. James Kelly has followed Dr. Bruce Bolt as President. Dr. Allan Cox is Vice President. Mr. John Grey has assumed a new position created to help meet the needs of a growing Academy as chairman of the executive committee. He brings to the Academy a wealth of knowledge and experience in the management of large organizations. And Hamilton W. Budge joined the Trustees for what we hope will be a long and productive term.

We must also note with great sorrow the untimely death of Katherine and Ernest Arbuckle in January 1986. As a dedicated Trustee, Mr. Arbuckle contributed greatly to the Academy in many ways; but he made special contributions most recently by heading the planning committee that studied the Academy's Master Plan, now being implemented, and by assisting actively in forming our advisory council. We will miss him for his wit and sage guidance and not least of all his great friendship for the Academy and those of us who are active here.

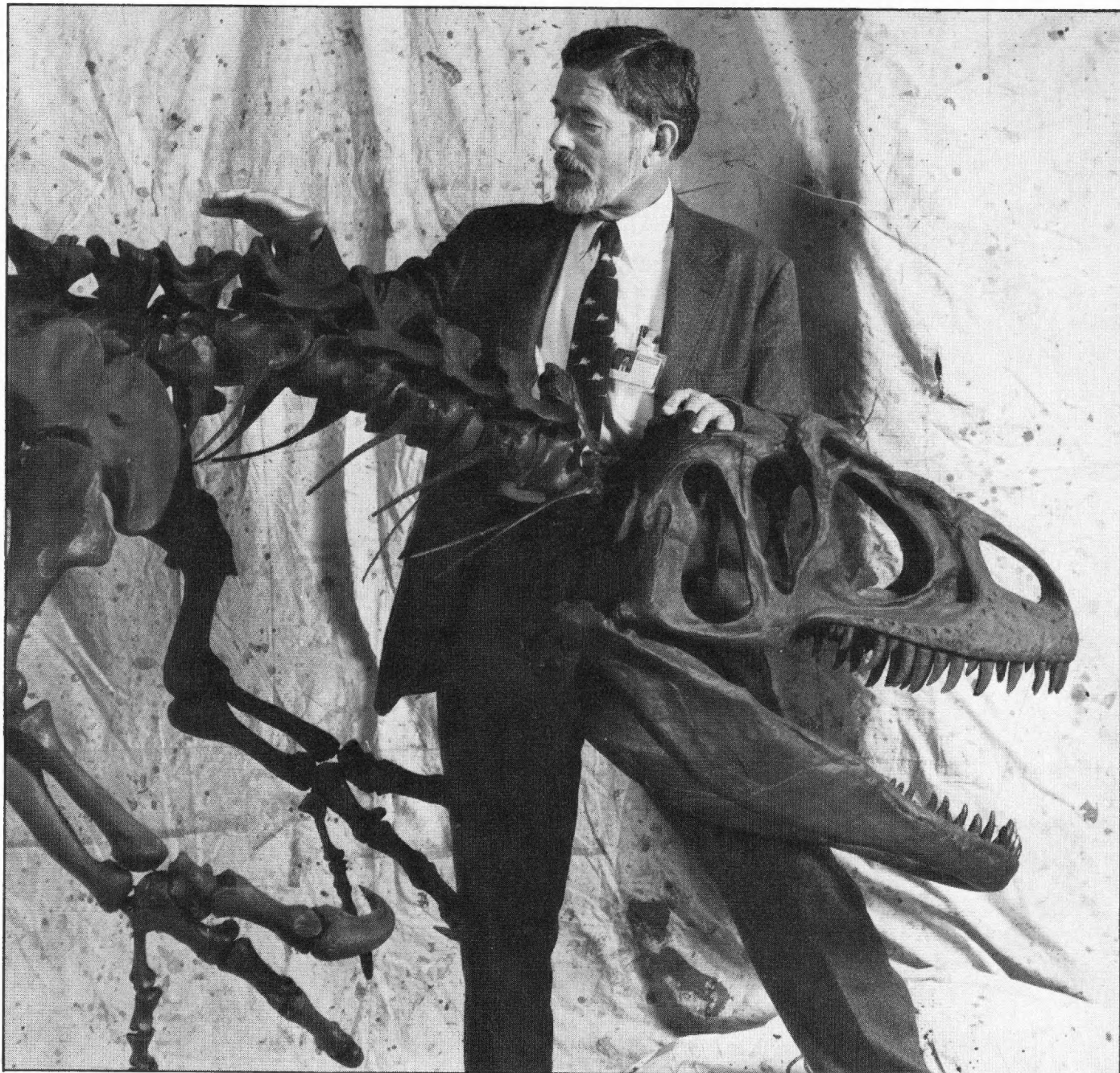
We hold to these truths as we proceed: San Francisco and northern California must have a forward-looking museum for the nat-

Chairman Jeffery Meyer visits a Wild California diorama during construction.

ural sciences. Thousands of schoolchildren, teachers, and adult visitors have come to expect and rely on our modern exhibits. Most notably, these public activities are supported by our significant scientific research activities behind the scenes. This synergism makes the Academy a special place—we know of no other natural history museum that has research, public exhibits, a world-famous aquarium, and a planetarium all under one roof within one of the world's great city parks. We continue to find high excitement in the Academy's broadening programs and we welcome your interest and participation in these activities.

Jeffery W. Meyer
Chairman of the Board of Trustees

DIRECTOR'S REPORT



Susan Middleton

THE CALIFORNIA ACADEMY OF SCIENCES is going through a dynamic phase—ideas are bubbling up from talented staff and volunteers for improvements and for new exciting ways of displaying nature. At the same time, architects Robinson, Mills, and Williams are creating an internal design to make a more comfortable and logical whole from the Academy's disparate parts, and also to improve and strengthen old structures. This needs funding to make it happen, and Trustees have spent endless hours working on that essential task. They have done wonders. With additional help from the city and county and from the state we have been able to start on two great new exhibits: *Wild California*, in the Meyer Hall, an update of the seventy-year-old North American Hall of Mammals; and *Life Through Time: the Evidence for Evolution*, a completely new exhibit, in the Peterson-McBean Hall, on the strange early forms of life. Some of these life forms are still alive today, like a fish with lungs; others are in fossil form, like the great dinosaurs. We believe these exhibits will set new

standards of design, educational quality, and attractiveness.

We could, in fact, call this "The Year of the Dinosaur." A further large dinosaur was needed for *Life Through Time*, and the staff set out to find one. With a little help from our good friends in vertebrate paleontology at UC Berkeley, we found an almost complete specimen of a large *Triceratops*, that three-horned, six-ton monster that roamed in herds over the area that is now Montana badlands some sixty-five million years ago.

This year the city and county set aside \$2 million in capital improvement funds for roof maintenance and the strengthening to current seismic standards of some of the 1916 building structures, and we owe great thanks to Mayor Dianne Feinstein and the Board of Supervisors.

Senator Milton Marks, Speaker Willie Brown, Assemblywoman Maxine Waters, and Senator Alfred Alquist and their staffs led the Academy's approach to the state of California for upgrading facilities and science exhibits. Governor George Deukmejian approved \$1.9 million in support from the state's oil-

leasing fund for planning building construction and for building science exhibits, and we are extremely grateful for this help.

Our schools need as much support with science education as they can get, and the Academy has worked hard at sharing its resources. Over a quarter of a million school children visited our museum in classes during the year, while the Academy provided seminars to teachers on the use of its science exhibits and on current research by the Academy's scientific Fellows. We plan to strengthen this program of involving science teachers in Academy activities in the coming year.

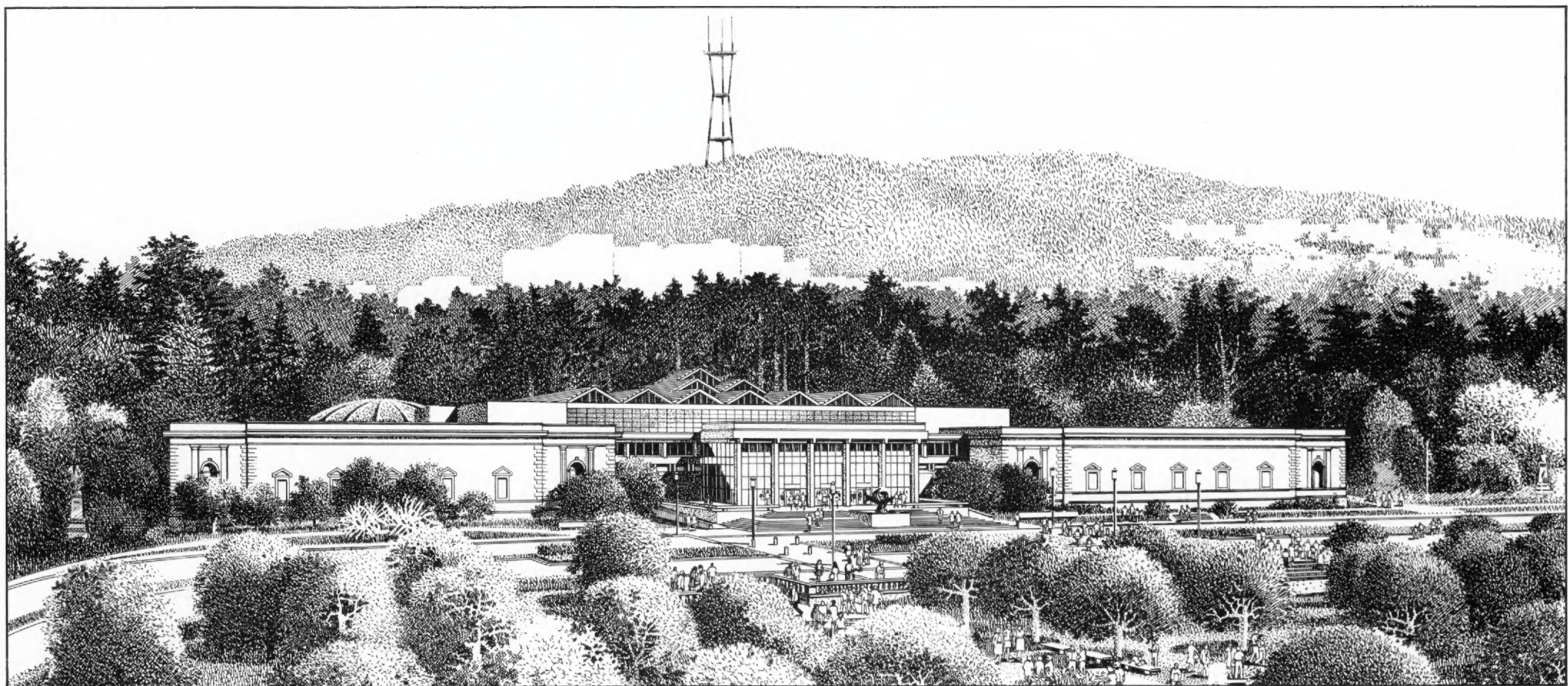
The Aquarium is also actively evolving, with new major displays and births to report. The black-footed penguins, a threatened species in the wild, have found their Academy home to their liking and have settled down to serious reproduction. We now have fluffy babies and sleek teenagers. These quaint and decorous birds have strong—and different—personalities and are much loved by staff and visitors.

During the year the Academy provided support through its collections to over one thousand visiting researchers and to eight state and federal departments. One of the institution's support services is to provide identification of venomous animals, such as snakes that have bitten a victim, and to rush the appropriate antivenin from its stocks to the hospital. Two such cases occurred during the current year.

Our own research workers continued to collect and study nature's "rare and rich productions" (to use the words given by the Academy's wise San Francisco founders in their statement of purpose) and to speak about their findings daily to the public on the main floor in the *Science in Action* program. This, and the radio *Science in Action* program produced by Jerry Kay (now reaching 2 million listeners per week), ensure that intriguing and worthwhile scientific findings go direct to the public, instead of being restricted to fellow scientists and tomes in libraries.

Special thanks to my colleagues on the staff, the volunteers, the Board of Trustees, and our thousands of donors and members for making this year—the Academy's one hundred and thirty-third—a great one.

Frank H. Talbot
Executive Director



Opposite: Dr. Frank H. Talbot, Executive Director, inspects the revised Allosaurus skeleton to be displayed in Life Through Time Hall.

Above: A representation of the Academy after completion of the Master Plan, as drawn by Academy architects Robinson Mills & Williams.

Left: Harriet Quarre, co-chair of the the Night of the Dinosaurs Ball, toasts the Academy with the Director.

Jim Patton

PUBLIC PROGRAMS

EUGENE F. BEHLEN, *Director of Public Programs*

DYNAMIC might be the best single word to describe Public Programs activities for this year. While some programs such as Traditional Arts, Adult Education, the Junior Academy, Docent Tours, Planetarium shows and Photography are ongoing, they have each had to change and adapt to the growing effects of the long-range plan we have begun to implement. These changes have meant stress for the staff, but they have also enhanced the Academy as a living educational and entertainment center. Thus we have increased attendance and the positive reactions of the public.

Typifying our dynamic life this year has been *Dinofest '85*. The concept was to preview our planned *Life Through Time* hall and make an exciting experience for the many summer visitors. *Twentieth-Century Dinosaurs*, from the hands of sculptor Jim Gary, filled the central courtyard, Cowell Hall, the front portico, and the Peterson McBean Gallery. The Education Department sponsored several weekend events for dinosaur loving kids, we produced our first grand scale fund-raising ball *Night of the Dinosaur* (netting \$53,000 for the *Life Through*

Time exhibits). Paintings and sculptures by artists William Stout, Sylvia and Stephen Czerkas, and Kevin Ramos elegantly depicted living dinosaurs. At the same time the largest dinosaur ever found, *Mamenchisaurus*, visited from China on its way to New York, nearly filling Cowell Hall. Visitors watched as our staff disassembled our resident *Allosaurus* and assembled the visiting monster. The Public Information Office handled all of these events, effectively obtaining free publicity and producing paid advertising using photographs from the Photography Department to emphasize our offerings.

The success of *Dinofest '85* took us right into the fall of 1985, when we opened a five-month exhibition of Gary Larson's irreverent science cartoons. The exhibit, *The Far Side of Science*, received plenty of local press, all of which helped bring the Academy its largest one-day attendance ever: more than 16,000 visitors. The show also attracted national attention. Since *The Far Side of Science* opened here, nine museums around the United States and Canada have contracted with the Academy for future showings in their facilities.

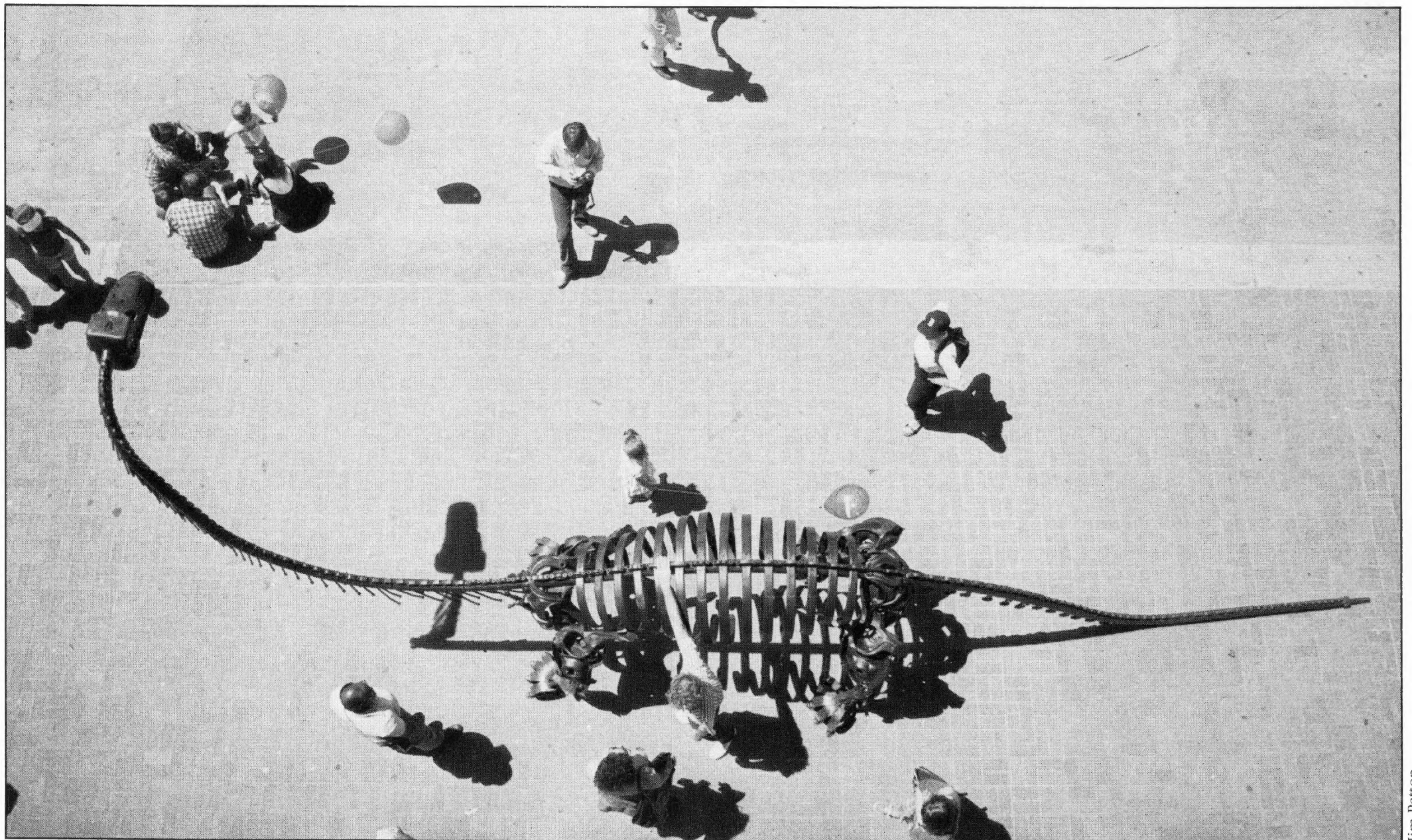
Other exhibits of note this year included

Ban Chiang: Discovery of a Lost Bronze Age—remarkable archeological findings from Thailand; Dugald Stermer's *Illustrations of Wild Life*; and *California Gold*—specimens from the California State Mineral Collection.

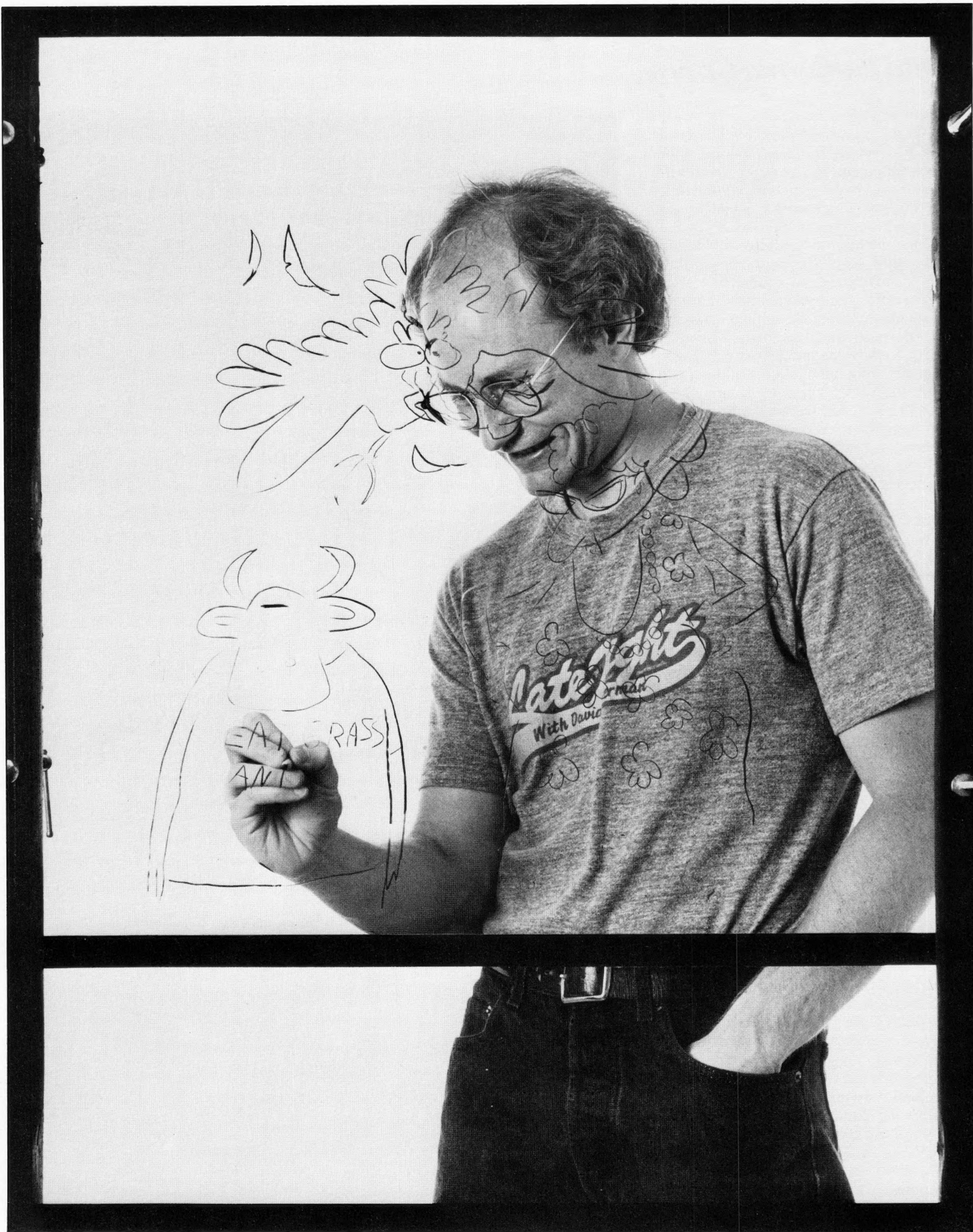
Contributing to the museum's educational programing, live performances and demonstrations have interpreted the themes of special exhibits. Dinosaur puppet shows and stories ran in conjunction with *Dinofest '85*. Cartoon demonstrations enthralled visitors to the Gary Larson *Far Side of Science* exhibit. Commemorating the 80th anniversary of the San Francisco earthquake, folk art offerings focused on the music and costume of the 1906 period with lace-making lectures and a Ragtime band, to augment the Academy's photographic display. Honoring *Festival of India*, our month-long series cel-

Right: The wit of cartoonist Gary Larson livened up the exhibit halls with his bit show, "The Far Side of Science," organized by Academy staff.

Below: Dinosaurs and visitors filled the Academy during Dinofest '85, which opened on a sparkling July 4th holiday.



Jim Patton



Susan Middleton

ON DISPLAY

Wild California Grows

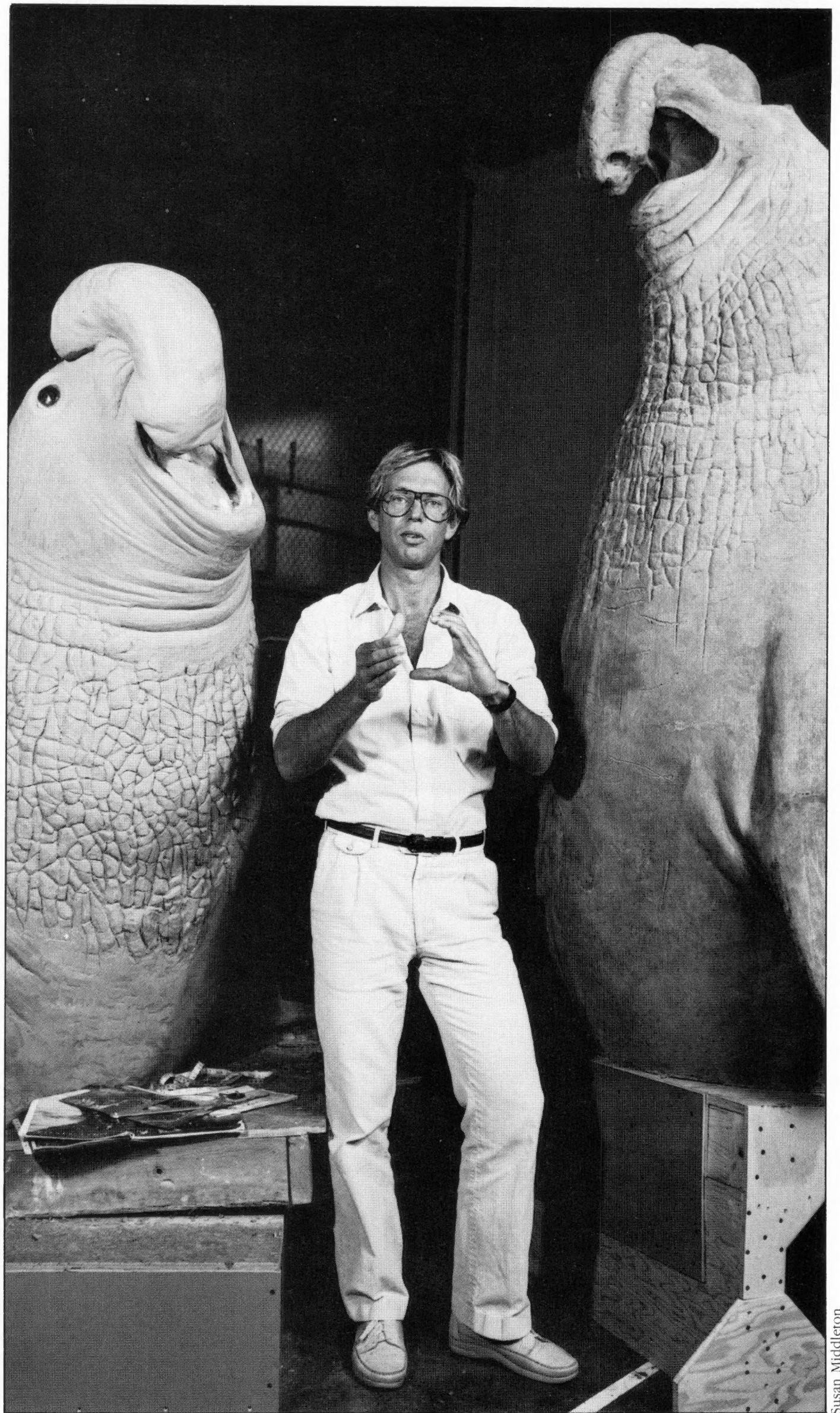
WHEN IT OPENED IN 1916, the Academy's North American Hall was a real ground-breaker—one of the first exhibit halls in the country to present dioramas of large animals in realistic poses. In a time without television, when movies were in flickering black and white, and when even the wildlife photos in *National Geographic* seemed static and posed, these dioramas were the only chance most people had to study wild creatures close at hand.

But the impact of the exhibits has faded over the years, and many of the animals had begun to show the ravages of time: insect damage, structural weakness, and dust. So when the Academy learned in early 1985 that the old hall needed reconstruction and seismic upgrading, it seemed like a good time to upgrade the exhibits as well. The question became how to present something educational that would excite the jaded, twentieth-century eye and still preserve the architectural and historic integrity of the hall.

The result is *Wild California*, a group of exhibits scheduled to open in the fall of 1988. Wild California preserves the basic layout—there will still be glass-enclosed dioramas down both sides of the hall. But sandwiched between will be something radically new: a walk-through chunk of the Farallon Islands complete with soaring rocky cliffs, battling elephant seals, and wheeling gulls. And as a backdrop, the hall's far end will frame a 33-foot-wide aquarium—a fish-filled wall of water from which will rise granite spires shingled with birds. "Because we have the Steinhart next door, an aquarium is the one thing we can do in our natural history hall that no one else in the country can," says Academy exhibits chairman Robert Kosturak. "The Farallon walk-through exhibit and aquarium will be totally unique. Nobody else has anything even close."

The Farallons are just one of many California places to be explored in the new hall. Each of the nine dioramas will present a characteristic environment—from the Mojave, to the Sierra, to the Central Valley, to the coast. About half of these dioramas will be given over to terrestrial habitats, about half to watery places. "As the educational theme for the hall developed," says Kosturak, "we decided we could teach two things: the nature of the habitat itself and the physical and behavioral adaptations of the creatures that live there."

Most of the terrestrial scenes will be reworkings of existing dioramas. Longtime Academy visitors will recognize updated old



Susan Middleton

friends in presentations entitled Mist Forest, Autumn Marsh, and Early Sierra Winter. The scenes have been changed a little to reflect the growth of scientific knowledge over the last seventy years. And each has been enriched with a variety of additional life to create lessons in ecological balance. "Right now," says Kosturak, "these dioramas are made up mostly of geological material, botanical material, and mammals. But we've brought in a cast of characters that really represents what each ecological niche should contain."

The marine scenes will be wholly new and will bend the concept of diorama as far as possible while still keeping the subject within the frame. "The idea," says Kosturak, "is to use this age-old technique to take viewers places they would never be able to go in real life." So one diorama will peek at the life in a half-cup of sea water, the creatures exploded 200 times their actual size. (A feather-duster worm will have tentacles like an octopus; microscopic plankton will appear the size of birds.) Other scenes will include a clam's-eye view of a coastal mud flat, the bustling community on a beached strand of kelp, and a cross-section of a tide-pool at high and low tide.

Each diorama will be flanked by a graceful explanatory graphic—styled after a page from a naturalist's notebook—and by a video monitor with three short programs exploring the habitat, behavior, and some special story about the creatures within the scene.

Steve Barbata, an exhibits consultant coordinating plans for the hall, calls *Wild California* "edu-tainment." "Our most important role is as educators," Barbata says. "We must communicate valid scientific information. But at the same time we have to realize that we are in competition with many other cultural institutions and events. For the designers, the hall has been an opportunity to find a new vocabulary for the science of exhibition—a presentation that will have the same kind of impact in the year 2000 that the old habitat groupings had in 1916."

Exhibits Chairman Robert Kosturak with models of elephant seals for Wild California.



Jim Patton

celebrating East Indian folklife featured dances from Gujarat State, the preparation of typical dishes, sari draping demonstrations, and *katyak* and *Bharatanatyam* classical dance.

The skies of this last year afforded Morrison Planetarium an opportunity to present dynamic shows and information on Halley's Comet. Displayed permanently in white neon across the ceiling of Science Hall, the orbit of this famous comet is now solidly associated with the Morrison Planetarium. This association stirred scores of Bay Area residents to call the Planetarium for information. Our staff and trustees were given special privileges to view the comet at the Hume Observatory, just readied for use at our Pepperwood Ranch Preserve. Our visitors were offered daily shows about the comet and its discoverer. Shorter public shows allow the Planetarium now to serve a broader public especially on weekends and our attendance was up twenty percent over the year. A computer controlled laservideo projection system is just one of the new pieces of equipment enhancing the abilities of the Planetarium staff to teach and entertain our audiences. *Concerts under the Stars*—a series of live performances accompanied by a star show—has found a receptive audience. Its innovative qualities attest to the department's creativity.

Alive at the Academy every day has been *Science in Action*, a program of educational demonstrations in Cowell Hall. These are performed by Academy scientists, support staff, plants and animals, giving visitors the chance to see what goes on behind the scenes. That is, we bring research out for them to view.

Thirty young delegates from the Children as Teachers of Peace Organization, children from all over the world, toured the Academy with members of the Docent program.

Science education has also been served through grants to establish *Biology Forum for Teachers*, a series of presentations by renowned scientists (Academy Fellows) and the Education Department for area science teachers. The programs covered many disciplines in the natural sciences, offering science teachers the chance to better understand current scientific topics. This year's forum was a pilot program that allowed one hundred and fifty teachers to bone up on their skills. The pilot program was highly successful and will continue for years of teacher training at the Academy.

Fifty-thousand active hours were spent at the Academy by our Academy volunteers. Tours, research, information, bookkeeping, and program help of all sorts more than doubled the effort by paid staff. We could not do our job at the Academy without the volunteers. Docents led 10,389 students through the Academy public exhibits making them come to life.

In spring 1986, the Aquarium entry hall was revised to better explain life beneath the sea. Dramatic and informational, the hall adds color and beauty to a space which was drab and unattended previously. Funding was found to construct a living coral reef in the Aquarium to open in 1987 as one of the few exhibits of its kind in the world.

During the year, the Academy's Morrison Auditorium was upgraded. New sound and

ON DISPLAY

Digging for Life Through Time

MANY NATURAL HISTORY EXHIBITS these days are cleverly crafted from plaster, fiberglass, latex, and paint. But there is no substitute for the real thing. So when Geology Department Chairman Dr. Peter Rodda and consulting paleontologist Dr. Lowell Dingus decided that the new hall *Life Through Time* should include an exhibit depicting the unearthing of a dinosaur, they elected to go out and unearth one themselves—the first time in Academy history that this has been done.

The Academy dinosaur team was lucky in knowing where to dig. For years, UC Berkeley paleontologist Dr. William Clemens has maintained an eastern Montana field station in known dinosaur country. Clemens pointed the Academy scientists toward likely

spots, and they unearthed first one bone and then another, but without uncovering a major skeleton. It was slow, dusty work, but finding the little dinosaur bones kept them going and excitement was running high. Finally the Geology Department's Tony Summers stumbled on a major find. "We have discovered," says Dr. Rodda, "what appears to be a complete, or nearly complete, skeleton of a *Triceratops*."

Triceratops was a three-horned Cretaceous plant-eater that carried a thick bony plate, called a frill, upon its neck. Specimens of *Triceratops* are not rare, but the Academy's animal is unusual in apparently being a juvenile. "We found a chunk of the side of the frill," Dr. Dingus explains. "In an older individual, this chunk would be fused to the

other bones of the skull to make a continuous collar all around." Geologist Rodda says that the Academy's animal will be of particular research interest when compared to other previously named *Triceratops*-like dinosaurs. "Many specimens are named from only a few bones, maybe just a skull," Rodda says. "When you look at whole animals of different sizes, you may discover that a specimen once identified as a separate species is in fact a juvenile."

As the hall's name suggests, *Life Through Time* will be a linear re-creation of earth's evolutionary history, from the first fossil evidence of life, 3.5 billion years ago, to the rise of human ancestors. Dr. Dingus, who is serving as scientific consultant on the project, explains that the goal of the hall is to teach



Susan Middleton

evolutionary theory by playing off the sequence of fossils one finds in the rocks with the sequence of changes seen in the anatomy of organisms. The point, he says, is to demonstrate that the animals sharing the greatest number of unique evolutionary features are the most closely related. "We will be concentrating on the evidence for evolution found in the products of evolution," Dingus says. "There is no hall in the country quite like it."

Dinosaurs will occupy a central position in the new hall. The big skeleton of *Allosaurus* that used to rear above the museum's main entrance has been completely disassembled and remounted in what scientists have determined is a more lifelike posture. And the model of the Cretaceous flying reptile *Quetzalcoatlus* that soared above the Dinofest exhibit in 1985 will again take wing.

The main Mesozoic diorama will feature two models of the diminutive bipedal dinosaur *Deinonychus*. Dingus likes the exhibit because it shows the way one group of organisms can evolve into another of radically different external appearance. Based on numerous skeletal similarities, the little dinosaur is the closest known fossil relative of the birds. This has led scientists to believe that birds evolved from ancient agile reptiles. "What's more," says Dingus, tossing off an example of the kind of proposition that makes science exciting, "if the group dinosaurs contains all common ancestors and descendants of dinosaurs, as would be logical, then birds are dinosaurs, and dinosaurs are not really extinct."

As for *Triceratops*, its bones will be arranged for display as they might have appeared at mid-excavation. "The exhibit will explain how the animal lived, died, was fossilized, excavated, and prepared," says geologist Rodda. And when the Academy crew heads for Montana to finish the excavation in the summer of 1986, they will take along video equipment to tape the proceedings. The resulting tape will be screened alongside the exhibit as a kind of science-in-action show and tell. For most museum visitors (curious bipedal creatures of the Holocene in the Cenozoic era) the exhibit will be the next best thing to standing at the edge of an excavation while 65-million-year-old bones are lifted once again into the light.

Dr. Lowell Dingus and Dr. Peter Rodda unearth a triceratops for Life Through Time Hall.



Susan Middleton

projection equipment was installed, walls were repainted, and new carpeting was laid. These improvements were made possible by the generosity of Trustees George S. Ishiyama, Peter McBean, and Jeffery W. Meyer.

This spirit of dynamic energy exemplifies the planning accomplished over the year: *Wild California* to be produced in the Meyer North American Hall advanced to a final design and budget estimate. Accepted by the Board of Trustees is a plan which, while retaining the general shape of the original 1916 gallery and retaining several of its dioramas, will reinterpret the ecology of both land and sea in our *State of Diversity*. Adding new plants and animals to many of the older dioramas and explaining them through the eyes of a naturalist on graphic panels and video tapes foster imagination and continued curiosity of the visitor. New dioramas showing highly magnified aspects of nature in kelp wrack, a spoonful of plankton and a careful look at the tidal salt marsh expands the way we explain the details of nature to our visitors. Just for fun and to manifest our intention of bringing the living success of the Steinhart Aquarium throughout the museum, a giant aquarium of Farallon Islands fishes will highlight *Wild California*. The visitor will reach it by walking up onto a rocky, elephant seal populated beach allowing all to experience those hard to visit islands just off the coast of our city. (See project profile, page 6.) This project was approved and funded by June 1986.

Also in design and beginning production is *Life Through Time: The Evidence of Evolution*. Moving the Middle Drive entrance from the center of the Peterson-McBean Gallery to the more logical Wattis Hall end was the first dramatic evidence that this gallery is soon to become our exhibit about the facts

Herpetologist Jens Vindum captivated members of the Curator's Circle donor group at a special evening event.

of evolution. (See project profile, page 8.) We are finishing a design which will allow the visitor to stroll through the entire history of life on this planet seeing the fossil record that will be verified by living counterparts and full-scale models and casts. This ambitious program promises to be one of the most important exhibits of its kind in the museum world and is being seen as subject of a major publication to be available throughout the country.

The public spaces of the Academy have grown throughout this century in Golden Gate Park. The present long-range plan addresses better organization of the gallery subjects and visitor experience. The Board of Trustees has approved an orientation and signage program to allow the visitor to understand the organization and available experiences of the public museum. Donor recognition, maps, and generic signs will make a more comfortable visit possible in the future and the planning is in place for implementation.

In keeping with the drive to tie all public programs into a cohesive unit, the Academy trustees decided to open The Academy Store. This store will be devoted to developing a series of products specific to the museum. Opening in January 1987, the store planning and design is underway. A new souvenir guidebook is also planned.

The Public Programs Committee recommended to the Board that we produce a strategic long-range plan, and an in-depth study of this plan is the story of Public Programs for 1986-87.

AQUARIUM

JOHN E. MCCOSKER, *Director of Steinhart Aquarium*

MANY IMPROVEMENTS and additions were made to the Aquarium this year by its competent staff of biologists, engineers, other Academy staff, and numerous volunteers and donors. Projects both within the Academy and far across the oceans brought new displays and new specimens for the public to enjoy. The avicultural staff succeeded in hatching and fledging two black-footed penguin chicks, named Dita and Oreo. The engineering staff, headed by Joe Brennan, maintained and improved much of the aging physical plant. Engineer Frank Bezek and Curator Tom Tucker oversaw a much-needed pro-

gram to remove toxic materials from the Academy.

The repainting and renovation of the dolphin and seal facility, a project funded by the Koret Foundation, the City and County of San Francisco, and numerous Academy members, occupied the engineers as well as dolphin keeper Bill Rohrs during the critical phase of animal relocation. All went well, and the display is vastly improved. Made possible by a grant from John E. duPont, the Aquarium's east foyer was transformed into a lovely and informative exhibit space, filled with informative graphics, specimens, and huge

photographs donated by filmmaker Al Giddings. Biologist Lloyd Gomez began planning for the construction of a living coral reef display within the Aquarium, a project funded by the Foster Davis Foundation.

Aquarium staff took leave on numerous busmen's holidays in search of their favorite phyla, such as Ed Miller's herpetological collections from Bonaire, Christina Slager's penguin and parrot rehabilitation research in Peru, Jonathan Mee's fishwatching and collecting in Madang, New Guinea, Bruce Hiler's frog research in Peru and Arizona, and McCosker's flashlight fish studies in the Caroline Islands. With support from The Peregrine Fund, Ed Ely surveyed the nesting success of prairie falcons and continued his condor observations. Other staff, including Tom Tucker, John Hewitt, Yaye Herman, and Patricia Morales attended national meetings and presented lectures. John McCosker presented invited lectures at various American and Canadian universities, museums, and at NASA and the US House of Representatives.

Research studies by Aquarium staff, other than that with the Department of Aquatic Research (see page 11), included John Hewitt's ongoing white shark physiology project, a novel solution to anchorworm infestation by Frank Glennon and emeritus curator Bob Dempster, Patricia Morales's studies of vertebrate pathology and husbandry, and McCosker's involvement with white shark attack-behavior and public policy. Staff participated in numerous media events, sharing their expertise about subjects ranging from El Niño to penguins and from sharks to humming fish.

Substantial supplemental funding to the city support of Steinhart Aquarium was provided by many generous individuals, including Mr. Foster Bam, Mr. Lester Gunther, Mr. John E. duPont, Mrs. Marriner Eccles, Mr. and Mrs. Jeffery Meyer, Mr. Al Giddings, and Mr. Carlton Colombat.

The California Tidepool is a great place for curious young minds and eager hands.



Susan Middleton

RESEARCH

DAVID H. KAVANAUGH, *Director of Research*

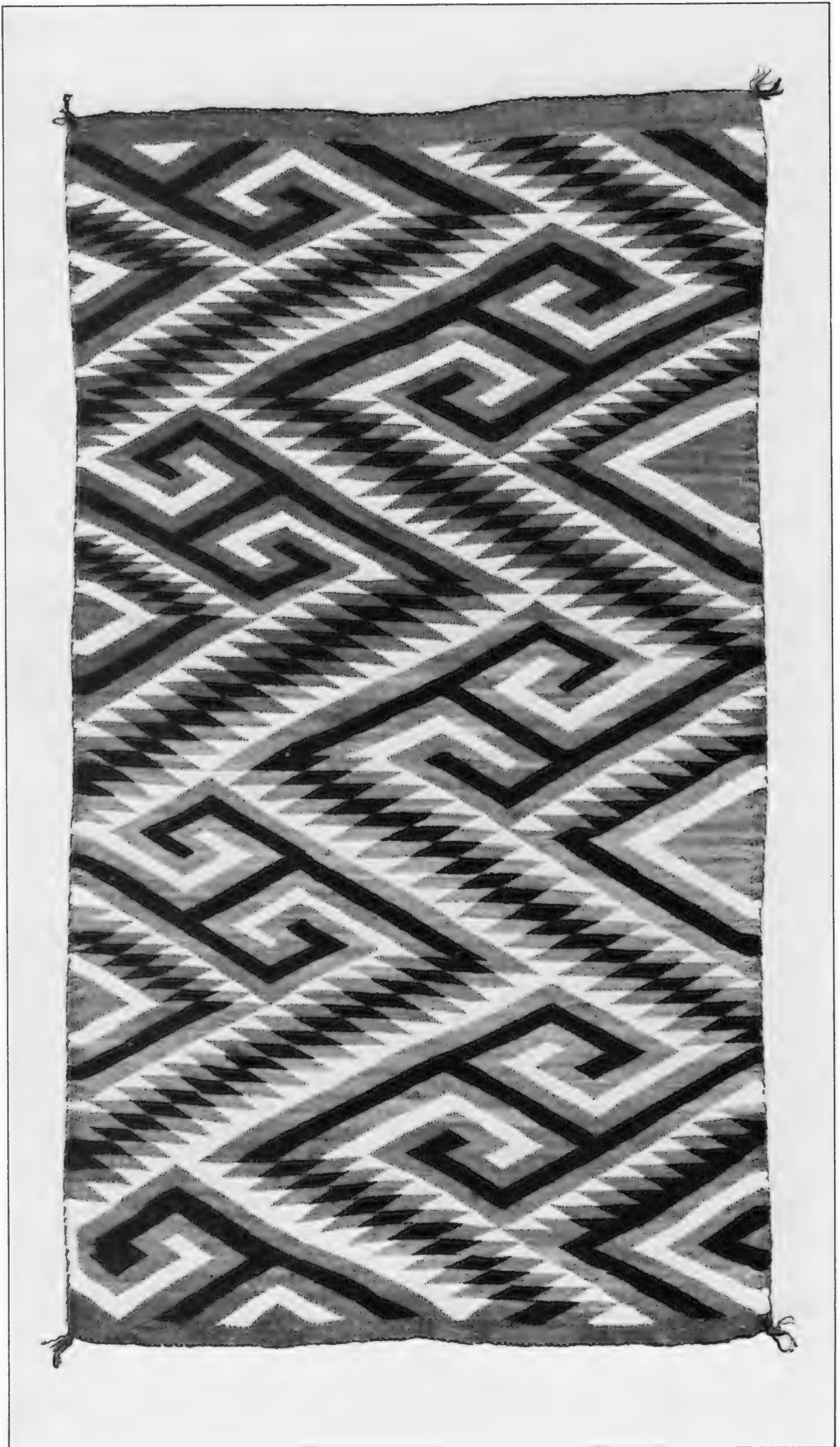
DURING THE PAST YEAR, departments of the Academy's Research Division expanded the scope of their research and curatorial activities while continuing to provide their traditionally high level of service to the scientific community, to federal, state, and local government agencies, and to the citizens of northern California. The Academy's expanding educational programs and development efforts during the past year involved research staff to an unprecedented degree. As a result, the Research Division is now linked through a broader array of cooperative interactions with other Academy divisions than ever before.

Responsibility for administration of the division passed from Frank Almeda, director since mid-1983, to David Kavanaugh in January, 1986, and a new divisional administrative office was established at that time. William Eschmeyer replaced Tomio Iwamoto as chairman of the Ichthyology Department. The Academy's archives, manuscripts and the Picture Collection, formerly administered as separate entities within the division, were brought together as a unit, now called Special Collections, within the Academy Library. Johan Kooy was named head of this unit.

Changes in Research Division staff during the year were few but notable. Alva Day, Associate Curator in Botany and Academy employee for the past ten years, retired in July 1985. In January 1986, Thomas Daniel joined the Botany Department as Assistant Curator. Previously, Dr. Daniel was Assistant Professor at the University of Arizona. Thomas Moritz, formerly fisheries-oceanography librarian at the University of Washington, assumed the position of Academy Librarian in February, 1986. David Catania replaced Stuart Poss as Collections Manager in Ichthyology.

The Academy remains committed to continued development, maintenance, and widest appropriate use of its research collections. During the past year, more than 185,000 specimens or lots were added to departmental collections, through the field efforts of research staff and associates and through donations from hundreds of individuals and institutions. More than 107,000 specimens or lots were loaned to professional scientists and graduate students

A Navajo rug c. 1940-1950 from the extensive Elkus Collection of Southwestern Indian art, donated to the Academy by the Elkus family.



Susan Middleton

Buried Treasure Found

TO A MUSEUM CURATOR, the only thing better than acquiring a priceless new specimen or artifact, is stumbling upon a rare find in your own collection that you didn't even know you had. This is precisely what happened to Dr. Robert Sayers this year. Sayers, the acting chairman of the Anthropology Department, has a long-standing interest in East Asian artifacts and was naturally excited when the Asian Art Museum, just across the concourse from the Academy, mounted a display of rare sixteenth- and seventeenth-century Japanese helmets. Sayers liked the exhibit so much he went back four times. "Then, the last week of the show," he says, "I happened to be thinking, 'Gee, we've got some old Japanese armor in our collection. Maybe I'd better take a look.'"

Sayers did take a look and then called up Yoshiko Kakudo, curator of the Japanese collection at the Asian Art Museum, and told her that she had better come look as

well. Kakudo brought with her Hiromichi Miura and Satoshi Tachibana, two curators from Japan who were in town to pack up the helmet show. The two were reserved but interested and carefully looked over the item Sayers had found. "It was an odd-looking thing," Sayers says, "with these three spikes sticking out of it, and it was in very bad shape. The top was bashed in and there were slashes along both sides." Yes indeed, said the Japanese curators, a very early example of a rare *kaware kabuto*, or "spectacular helmet."

Sayers couldn't tell what the Japanese curators thought of his find. "They didn't seem very excited," he says. But people heard them giggling as they left the building, taking the helmet back to the art museum for a better look. And shortly afterward the telephone rang on the desk of Academy executive director Frank Talbot. The caller was Rand Castile, Talbot's counterpart at the Asian Museum. "This is the most exciting

find I've ever been party to," he told Talbot. "I'm calling a press conference for tomorrow morning."

Anthropologists estimate that only five hundred of these early Japanese helmets exist, and the Academy's helmet may be the only one in a permanent collection in the United States. The helmet dates to the late-sixteenth century, a time in Japan of samurais and shoguns and intense clan warfare. Unlike the basic, utilitarian Japanese helmet—a plain pot-shaped affair—the so-called spectacular helmets were often crafted in ornate and bizarre totemic shapes: rabbits, for example, or pumpkins, or lobsters, or Buddhist scrolls. The three points of the Academy's helmet resemble the peaks of a mountain. They are also suggestive of the Japanese character *san*, which stands for "mountain." The helmet, Sayers says, "may well be a sort of visual play on words."

Spectacular helmets were built of a kind of papier-mâché layered onto an iron pot



Chris Stewart, Courtesy of the San Francisco Chronicle

and finished with lacquer. The Academy's helmet is simple in design, suggesting an early date. Although such headgear was used mostly for ceremonial occasions, the slashes on the sides of the Academy's helmet may well be the imprints of ancient swords. "You can only wonder," Sayers says, "if the helmet went through the Battle of Sekigahara or one of the other great conflicts in seventeenth-century Japan. It inspires the imagination."

The discovery of the Japanese helmet is emblematic of recent activity in the Anthropology Department. "In the last year we've been reorganizing the storeroom, and we've found a lot of things we didn't know we had," Sayers says. Like much of this "lost" material, the helmet probably came out of the old pre-1906 earthquake Academy building on Market Street. Assorted Japanese armor appears on a list of materials discovered in the basement of North American Hall in the mid-1970s. (At that time there was no anthropologist on staff to make a careful inspection.) The newspapers in which the material was wrapped were dated May 1906, a month after the big temblor.

Sayers eventually plans to exhibit the helmet in Wattis Hall, alongside the present diorama of Japanese peasant life of the same period. The text of the exhibit already discusses the samurai class that would have worn the helmet. The genuine article, Sayers says, "will be the perfect complement."

Sayers also hopes that the discovery of the helmet will fuel a new interest in Asian artifacts at the Academy. "Not only because of my own interest in the area," he says, "but because of where the Academy sits, on the Pacific rim. We're very interested in adding more treasures to our East Asian collection."

Asian Art Museum Director Rand Castile and Academy Executive Director Frank Talbot present the newly discovered, rare Japanese helmet.

RESEARCH ACTIVITY IN SCIENTIFIC DEPARTMENT COLLECTIONS <i>Divisional Summary</i>			
DEPARTMENT	ACQUISITIONS	LOANS	RESEARCH VISITORS
	Total Specimens (no. of lots or acquisitions)	Total Specimens (no. of lots or acquisitions)	Total Visitors (no. of visitor days)
Anthropology	394 specimens	160 specimens	111
Aquatic Research	n/a	n/a	190
Botany	20,500 specimens	11,923 specimens	452
Entomology	147,430 specimens	80,867 specimens	875
Herpetology	2,800 specimens	5,045 specimens	160
Ichthyology	9,614 specimens	8,574 specimens	380
Invertebrate Zoology and Geology	3,847 lots	540 lots	146
Ornithology and Mammalogy	647 specimens	203 specimens	278

around the world in support of their research projects in systematic biology. Visiting scientists spent more than 2,450 days at the Academy during the year, an average of ten each working day, examining material in the collections, making use of library resources, or in discussions with Academy staff members. The table on page 13 provides an account of collection growth and use, by department, for the past year.

Some of the more important acquisitions of the past year included: a large collection of Tlingit artifacts collected at Klukwan, Alaska in 1917; 3,000 botanical specimens collected by Frank Almeda in Costa Rica; more than 400 of T.D.A. Cockrell's primary typed specimens of bee species; the J. Wilcox collection of 27,500 asilid, mydid, and apiocerid flies; a large collection of herpetological specimens from New Caledonia; the A. Ferreira collection of chitons; and the preserved fish collection assembled mainly by professors Needham and Barlow, which was transferred from the University of California, Berkeley.

Installation began on a compact storage system in Invertebrate Zoology and Geology. The first phase of this project, partially funded by a grant from the National Science Foundation, will provide storage for all fossil specimens and the dry-preserved living invertebrates. When completed, the system will double the storage capacity of the ground floor collection area.

Applications of computer technology to improve and expand collection management accelerated throughout the division during the year. Loan records and other collection-use data were partially or fully

committed to computer databases in Botany, Entomology, Herpetology, Ichthyology, and Ornithology and Mammalogy. Supported by a three-year grant from the National Science Foundation, a computer catalog of the bird and mammal collections was begun. As part of this project, the nearly 11,000-specimen bird collection from Stanford University is being integrated with the Academy collection; and excellent progress was made toward both project goals during the year. The Entomology Department began computer catalogs of taxonomic holdings, primary type specimens, and specimen holdings for geographical regions (e.g., the Galápagos Islands) and produced a computerized listing of the 887 families of arthropods represented in the collections.

The national and international importance of the Academy's research collections and the high level of their use by the scientific community was clearly recognized by the National Science Foundation during the year through its grant support for the care, use, and improvement of collections and facilities in Botany, Entomology, Herpetology, Ichthyology, Invertebrate Zoology and Geology, and Ornithology and Mammalogy. New five-year grants were approved for Entomology and Ichthyology; and the Academy gratefully acknowledges this continued and substantial support from the foundation. The National Oceanographic and Atmospheric Administration (NOAA) renewed its contract with the Ichthyology Department, which provides taxonomic identifications and maintains a voucher specimen collection for the Bureau of Land Managements's Outer Conti-

Compound Interest in Papua New Guinea

NOTHING INSPIRES AND CHALLENGES an Academy biologist more than a new environment teeming with unstudied and uncataloged life. This year Academy scientists gained access to just such a area with the opening of the Christensen Research Institute in Madang Province on the north coast of Papua New Guinea. The institute is a field research station endowed by American mining executive Allen Christensen. Each year the Christensen Fund will provide airfare, food, lodging, and the well-equipped CRI laboratory to twenty-five scientists—five of them from the Academy and five each

from four other international research institutions.

Invertebrate zoologist Dr. Daphne Fautin, who has a long-standing interest in the marine fauna of the South Pacific, is coordinating CRI research for the Academy. The institute is unusual, she says, in being supported by proceeds from Christensen's Jais Aben Resort, with which it shares 22 waterfront acres. It is also exceptional for the unspoiled richness of the study area. "This is virgin territory scientifically," Fautin says. "Long-term scientific studies have never been done there. The marine environment is pristine."

Dr. Fautin completed two months of research at CRI even before the institute formally opened in January of 1986. For Fautin, the facilities and study area were ideal. Boats and diving equipment were available on site, and the lagoon was rich in her study animals—certain species of sea anemones that provide shelter and protection for particular species of fish. "I have worked extensively in that part of the world," Fautin says, "and have visited no other area where the ten known species of symbiotic anemones all occur."

Fautin is interested in the dynamics of the relationship between the anemones and the



Susan Middleton

fishes. "One of the great mysteries," she says, "is how these fish can live among the tentacles of the anemones and not be stung and eaten." She also wants to know why certain species of fish choose certain anemones and avoid others, and how two species of fish are able to share the same species of anemone when evolutionary theory predicts that this wouldn't be so. "What I'm really trying to figure out," she says, "is what it is about the anemone that a fish likes and how the two organisms influence one another. I'm interested in the entire symbiosis, the living together of unlike organisms."

While at CRI, Fautin happily spent at least three hours a day in scuba gear—mapping her underwater study area, tagging anemones, and moving anemonefish from one anemone to another to evaluate competitive interactions. Back at the laboratory, she would spend the balance of the day transcribing her data off of underwater slates, doing her statistical analyses, reading scientific literature, and planning her research for the next day.

The Academy has been in on plans for CRI from the beginning. As director of one of the five sponsoring institutions, Dr. Frank Talbot sits on the institute's Board of Directors. He also consulted on the layout of the laboratory itself, which was designed and equipped by Stuart Poss, then collections manager of the Academy's Ichthyology Department.

Dr. Fautin will be returning to CRI next year to follow up on ongoing experiments. And she has nearly filled the schedule with other Academy scientists for the next five years—not just marine biologists, but ornithologists, entomologists, and botanists as well.

The goal of the program is not only to learn, Fautin points out, but to make a genuine contribution to Papua New Guinea and its ability to plan its future. "Being so exotic, PNG has been the victim of a lot of instant experts," she says. "People dash in, grab specimens, artifacts, and information and then dash out again." But Academy scientists will stay at CRI for a minimum of a six weeks, and the average stay will be more like eight to ten weeks. "This is a way of saying that our scientists are going to take an interest in the country," Fautin says. "They're going to write guidebooks to what they find. They're going to inventory the flora and fauna so that the Papua New Guineans know what they have."

Associate Curator of Invertebrate Zoology
Daphne Fautin.



Susan Middleton

mental Shelf Environmental Assessment Program.

In 1985–86, the Academy began a five-year relationship with the newly established Christensen Research Institute at Madang, Papua New Guinea. (See project profile, page 14.) Academy research scientists and colleagues from Stanford University, Oxford University, the University of Papua New Guinea, and the CSIRO (Australia) will conduct field research in Madang Province with the support of the institute. Two Academy researchers, Daphne Fautin and Stuart Poss were the first to use the new facility. Dr. Fautin began a long-term study of sea anemones and corallimorpharians of the region; and Dr. Poss studied scorpionfishes and surveyed coral reef fishes at Madang. The Tilton Postdoctoral Fellowship for 1985–86 was awarded to Lynne R. Parenti to carry out her research incorporating physiological, genetic, and morphological data to ascertain phylogenetic relationships among advanced bony fishes. Hiroshi Uwa, a cytogeneticist from Shinshu University, Matsumoto, Japan, spent four months at the Academy collaborating with Dr. Parenti on studies of the morphological and genetic evolution of ricefishes.

Research staff enjoyed an active and productive year of field and laboratory research. Robert Sayers continued preparations for a forthcoming book on Pueblo Indian material culture. Chuck Cecil joined Research Associate Karen Bruhns in mapping and excavating the site of Pirincay, Ecuador, which served as the focal point for Amazon-Pacific trade during the first millennium B.C.

John McCosker completed his systematic research on ophichthid and muraenid eels

Chemically transformed to render flesh clear, bone red, and cartilage blue, specimens in the Academy's Herpetology collection await further research use.

and worked with Frank Hubach to solve the mystery of the Sausalito hum, caused by San Francisco Bay residents known as singing toadfish. Richard Rosenblatt, professor of marine biology at Scripps Institution of Oceanography, spent his six-month sabbatical leave at the Academy working with Dr. McCosker on the systematics of chaenopsid and anomalopid fishes.

Dennis Breedlove studied material in herbaria at Kew, Paris, Brussels, Madrid, and Geneva in October; collected in Baja California in February; received a short-term visitor appointment at the Smithsonian Institution in April; and was awarded a research grant from the National Geographic Society—all for his research on the oaks of the Neotropical Region. Frank Alameda collected for six weeks in Costa Rica as part of his research on the Melastomataceae. Thomas Daniel completed his monograph of *Tetramerium* (Acanthaceae) and the flora of the South Mountains in Arizona, and he visited herbaria at the Missouri Botanical Garden, the Field Museum of Natural History, and the University of Michigan. Bruce Bartholomew participated in a scientific exchange supported by the National Science Foundation, which brought two botanists from the People's Republic of China to North America for joint fieldwork in Mexico during October and November and sent Dr. Bartholomew to Yunnan Province with these colleagues in March to study wild populations of *Camellia reticulata*. Bartholomew also received a National Geographic Society

Systematically Sorting Out the Mollusks

SYSTEMATICS—the naming and classification of organisms according to their natural relationships—is the core and substance of what museum scientists do and a prime purpose of the vast research collections institutions like the Academy maintain. For hundreds of years, systematics has been done in much the same way: by studying the similarities of structure between different plants or animals. Such “morphological” studies have concentrated largely on the gross structure of living things—on evolutionary changes in bones, teeth, and organ systems.

But in the summer of 1985, invertebrate zoologist Dr. Michael Ghiselin began to undertake experiments that promise an entirely new way of studying animal systemat-

ics at the Academy. Using a technique developed in the laboratory of Dr. Norman Pace at Indiana University, Ghiselin is studying the structure of a specific molecule of RNA that exists in all animals. This molecule, called 18S ribosomal RNA, is found in the ribosomes, which are the protein factories of living cells. “We’re still doing morphology, still studying structure,” Ghiselin says, “but it is the morphology of a molecule, which for purposes of biology is the smallest meaningful unit of living matter.

“The basic principle is that as time passes, things get different,” Ghiselin says. “If you take a single organism and its progeny, these molecules of RNA should be just about identical.” But the structure of the molecule can be expected to change as organisms evolve.

This means that the cells of closely related creatures should contain similarly structured molecules, the cells of less closely related creatures should contain less similar molecules, and so forth along the divergent tree of evolution.

All RNA molecules are composed of four different subunits, called nucleotides, arranged one after another in a long chain. The frequency and sequence in which these nucleotides appear is what makes one molecule different from another. The Indiana University technique, a form of “RNA sequencing,” provides Ghiselin with a map of a portion of the molecule, showing the locations of each nucleotide. By comparing the RNA map of one organism to that of another, Ghiselin and his collaborators are able to



Steve Ringman, Courtesy of the San Francisco Chronicle

study the degree of difference and reach conclusions about the relationship of one creature to another.

There are other techniques of RNA sequencing, Ghiselin says, but this new one is much faster than the others, enabling scientists to do studies in a week that used to take a year. And while the technique will soon be available to a wide variety of investigators, the Academy is in on the ground floor. "No other institution in the world is tooled up to do animal systematics using this technique," he says. "I am the only participant in the Indiana project that is not on their staff."

The work is just beginning. Ghiselin and his associates have studied RNA from a group of echinoderms—brittle stars, sea urchins, sea cucumbers, and the like—and a few samples of other representative lineages. It is still too early to tell about the eventual usefulness of the technique. "We might suddenly run an animal that gave us big changes that make no sense," Ghiselin says, "or the whole thing may become unstable as we add more creatures to the picture." But so far, results seem promising, suggesting relationships predicted by other systematic work. Ghiselin is anxious to use the technique to sort out the mollusks, his own principal interest. Beyond that, however, he wants nothing less than to do a complete catalog of the animal kingdom.

"I'm excited about this technique," Dr. Ghiselin says. "For years we've been using anatomy not only to establish the phylogenetic tree, but to develop a narrative account of the history of life on earth. But if we use the anatomy to find out what the tree is, then turn around and use the tree to interpret the anatomy, we might end up reasoning in a circle. If we can use the molecules to establish the relationships, we can say 'all right, here's the tree, let's fit the anatomy to it and see what we get.' Among other things this will help us understand what kinds of changes really reflect ancestry. It will be a new and excitingly different kind of systematics."

MacArthur Fellow Michael Ghiselin in the mollusk collection at the Academy.



Marc Charnow

grant that supported four weeks of fieldwork in Bhutan during April.

Paul Arnaud served as editor and contributor for a Festschrift volume in honor of Cornelius B. Philip, Academy Fellow. David Kavanaugh continued his studies of the carabid beetle fauna of the Pacific Northwest with fieldwork in Alaska. Wojciech Pulawski collected sphecoid wasps in the southwestern U.S. as part of his monographic study of the genus *Tachysphex*. Hua Lizhong, from Zhongshan University, Guangzhou, People's Republic of China, spent six months at the Academy studying long-horned wood-boring beetles (Cerambycidae) from China.

Robert Drewes completed his approved leave at Oxford University, collected in Botswana and Kenya, and met with colleagues in Dar es Salam, Tanzania. Alan Leviton completed his study of snakes of the genus *Coluber* from the Middle East. Jens Vindum and Larry Wishmeyer collected herpetological specimens in Kenya and Micronesia and in New Caledonia, respectively.

William Eschmeyer continued his work on a computer database for fishes of the world, which already includes records for about 13,200 genera and 4,500 literature references. Tomio Iwamoto attended the Second International Conference on Indo-Pacific Fishes in Tokyo and worked with Osamu Okamura at Kochi University on joint studies of grenadier fishes.

Peter Rodda, Jean DeMouthe, and Philip Summers joined Exhibits Department staff members for a field expedition to Creta-

Part of the Academy's valuable research collections, this ammonite (Dactylioceras sp.) is of the Jurassic period.

ceous deposits in eastern Montana to collect dinosaurs and associated fossils for use in the forthcoming hall of *Life Through Time*. (See project profile, page 8.) Daphne Fautin continued her research on sea anemones of the Pacific coast with her fieldwork at Bamfield Marine Station on Vancouver Island, British Columbia, in addition to her work in Papua New Guinea. (See project profile, page 14.) Michael Ghiselin was a visiting professor at the University of Pavia, Italy, for three months and also continued his systematic research, using comparative molecular techniques, at Indiana University. (See project profile, page 16.) Terrance Gosliner continued his systematic and evolutionary studies of opisthobranch mollusks through fieldwork in Quintana Roo and Baja California, Mexico, in the Hawaiian Islands, and at Aldabra Atoll in the Indian Ocean.

Luis Baptista expanded his long-term studies of song dialects in white-crowned sparrows to include a new study site in the Rocky Mountains of Alberta. He also organized and chaired a symposium on production and control of bird song for the 19th International Ornithological Congress in Ottawa, Ontario. Stephen Bailey continued his study of the endangered California least tern and was elected to the ten-member California Bird Records committee.

ADMINISTRATION

NANCY B. DYKES, *Director of Administration*

IT IS DIFFICULT TO HIGHLIGHT the support functions of the Administrative Division. The efforts here are largely ongoing and inconspicuous: skillful people working quietly to help keep the Academy's public display, publications, and research programs active and effective.

This year we hired the Academy's first full-time personnel professional to coordinate and manage our compensation and personnel programs. Dolores Rogers has now codified many long-standing, though unwritten, rules and regulations and has brought a more professional and legal character to our policies and procedures.

The Business Office, with Controller Jane Yau's careful direction, expanded its busy accounting and management-reporting functions to include the growing needs of the capital campaign.

The Admissions staff, supervised by Cathy Skotvold, accurately reported attendance figures and daily income from our 1,581,837 visitors during the year—the second-largest annual attendance ever recorded.

The Operations Department, directed by Operations Manager Frank DeOme, continued to carry out a multitude of essential

functions including building maintenance and construction supervision; technical services on the variety of audio, visual, laser, and computer components being used throughout our exhibits; custodial and security functions; and in-house printing services. Some major projects included assistance in planning the relocation of the Middle Drive entrance to the museum, construction of the giant microscope installed in *The Far Side of Science* exhibit; installation of collection compactors in the Departments of Invertebrate Zoology and Geology, and installation of the new telephone system.

Also within the year several long-term construction projects were undertaken. Supervision of these projects, such as the seismic upgrading of North American Hall, was turned over to Glen Angell, Project Manager and Construction Advisor to the Director.

Public interest in the Academy's programs was maintained and heightened by the activities of our Public Information Office under Pam Wing. As just one example, the office originated and promoted *The Run to The Far Side*, a ten-kilometer race scheduled as a splashy opening for *The Far Side of Science* exhibit. Academy staff expected not more than a thousand runners; six thousand

showed up. The race, originally planned as a promotional event, ended up netting the institution \$28,000. Ongoing Public Information programs included the Academy's radio program *Science in Action*, by Jerry Kay, which this year expanded to twelve California stations with the continuing support of the Packard Foundation and the Hewlett-Packard Foundation; and our live *Science in Action* educational demonstrations held daily in the museum. Topics this year ranged from penguins to Mexican jumping beans.

Academy publications functions were further consolidated this year under the direction of *Pacific Discovery* Editor Sheridan Warrick. The department now oversees production of the Academy's *Proceedings*, *Occasional Papers*, and *Memoirs*; Special Publications, such as exhibit catalogs and fundraising documents; the Annual Report—as well as *Pacific Discovery* magazine.

Continuing legal guidance was provided by Academy Counsel Brett Stearns.

Over 6,000 runners competed in the first annual Run to the Far Side, sponsored by the Academy.



Jim Patton

DEVELOPMENT

DIANA COLEMAN, *Director of Development*

PRIVATE SUPPORT FROM INDIVIDUALS, foundations, and the business community is increasingly important to the continued survival and success of the California Academy of Sciences. Gifts to the Academy during fiscal year 1985–86 reached an all-time high of \$1.4 million, with an additional \$2.7 million raised for the capital campaign. The number of annual donors of \$100 and more increased by 14 percent over those in the previous year.

Contributions to the Academy are invested where the need is greatest. Donations support scientific research, enhance the collections of rare specimens, sponsor teacher workshops, provide education programs for the more than 494,000 children who visit the Academy annually, sponsor visiting lecturers and help fund new and stimulating exhibits such as Gary Larson's popular *Far Side of Science* exhibit.

This year, for the first time, the Academy sponsored a major fundraising event—the *Night of the Dinosaurs* in October 1985, a dinner-dance that raised \$53,000 for the *Deinonychus* dinosaurs to be installed in the new *Life Through Time* exhibit scheduled to open in 1988. The event's success was due largely to the volunteer efforts of Chairs Marianne Peterson and Harriet Quarre with Corporate Chairman Jack Grey. The event was coordinated by staff members Sandy Lelich and Deidre Kernan.

All donors are recognized for their involvement in furthering the research and educational missions of the Academy. Annual donors of \$100 and more enjoy special benefits including receptions with curators and exhibit opening parties.

Special recognition is extended to all corporate and foundation donors, Benefactors, persons who contributed \$1,000 and more as Friends, and members of the Trustees' Circle. The Academy is particularly pleased to welcome four new Benefactors—E. Morris Cox, Mr. and Mrs. Wilbur I. Follett, Mr. and Mrs. Joseph A. Moore, and Miss Jane Newhall. These donors join a distinguished group of persons whose cumulative gifts to the Academy exceed \$50,000.

Several personnel changes in the Development Division during the past year brought new vigor to our fundraising efforts. Diana Coleman succeeded Charles Raaberg in February 1986 as Director of Development. A new part-time fundraiser position, created in fall 1985, was filled by Kathryn Hecht, who is working to attract special project gifts from foundations and corporations. Assistant Membership Coordinator Theresa Shulze transferred to the Se-



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curity Department as a guard and was succeeded by Lisa Macias.

Also during this time, the Academy's membership grew from 20,593 to 21,272, a three percent increase over last year. Two member-acquisition mailings brought in 3,000 new Academy members. The first new member orientations were held beginning in fall 1985 to introduce members to the Academy with presentations by Executive Director Frank Talbot and by Trustee William J. Hume.

Under the aegis of the Travel Office, the Academy hosted thirteen national and international trips. On these excursions members joined Academy scientists for a special view of the natural world. In San Francisco, numerous lectures, films, symposia, and events brought the Academy's educational message to the membership. These included the Claire Matzger Lilienthal Distinguished Lecturer Carl Sagan speaking on Halley's Comet, Jane Goodall discussing the mother-child bond in chimpanzees, and astronaut Jeffrey Hoffman lecturing on the past and

Astronomer Carl Sagan with Ernest R. Lilienthal at the Claire Matzger Lilienthal Distinguished Lecture.

future of the National Aeronautics and Space Administration.

Always popular as a special place for parties, the Academy continued to rent its facilities to other organizations. This year, more than seventy groups contributed \$95,000.

Much of the success of the Academy's development, membership, travel, and special programs can be credited to the dedication of the Trustees and our many other volunteers. Notable for their superior leadership during the past year are former Chairman of the Board Rudolph Peterson, succeeded by Jeffery Meyer, who also continues to chair the campaign to fund the master plan. Chairman Meyer formerly led the Development Committee and passed this challenging position on to William Hume, who stepped down as chairman of the Membership Committee.

PEPPERWOOD RANCH NATURAL PRESERVE

GEORGE LINDSAY, *Director of Pepperwood Ranch Natural Preserve*

PEPPERWOOD is a 3,100-acre property—nearly 5 square miles of California coast range terrain—located in Sonoma County sixty miles north of San Francisco. Formerly owned by Academy benefactors Mr. and Mrs. Kenneth K. Bechtel, it was given to the Academy by their Belvedere Scientific Fund after Mr. Bechtel's death. The Fund continues to provide substantial support for the Preserve.

Protection of a large unit of unspoiled natural land with diverse habitats is the principal purpose of Pepperwood Ranch Natural Preserve. Secondary but also important is compatible utilization of the Preserve for research and education projects and programs.

Educational uses of Pepperwood included botanical and geological day tours for adults and field trips and camps for Junior Academy members. The facility was used by universities and other institutions, as well as natural history clubs and organizations.

The Preserve's Hume Observatory, constructed with generous contributions from Trustee and Mrs. William J. Hume, began operation this year, allowing visitors clear views of the night sky with portable telescopes.

Installation of the Observatory's two permanent telescopes—a 12-inch Tinsley reflecting telescope and a 6-inch Alvin Clarke refracting telescope made in the late 1800s—will be completed during the next fiscal year. Steven Craig, Morrison Planetarium

Chairman, Leon Salanave, Planetarium Associate, and Fred Funk, Pepperwood Resident Supervisor, have been active in supervising the Observatory's management and operation.



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THE FELLOWS of the California Academy of Sciences are an important part of the institution—the governing body of eminent scientists and trustees whose predecessors founded the institution 133 years ago. These individuals represent the full range of disciplines within the natural sciences and are appointed in recognition of their contributions to the growth of scientific knowledge, particularly in the Pacific region. Nominated by their colleagues and appointed by the Board of Trustees at the recommendation of the Science Council, the fellows remain members of the fellowship for life.

Fellows Medalist

EACH YEAR, one or more prominent fellows is selected for special honors. At the annual fellows meeting in October 1986, the institution's highest honor, the Fellows' Medal, was presented to John Thomas Howell, California Academy of Sciences Curator Emeritus in the Department of Botany in recognition of his outstanding achievements in botanical research and for his active participation in advancing the work of the Academy.

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AND SUPPLEMENTARY DATA

Balance Sheets

Year Ended 30 June 1986

	<i>Current funds</i>		<i>Endowment Funds</i>			<i>Total All Funds</i>	
	<i>General Operating Fund</i>	<i>Restricted Funds</i>	<i>General Purpose Endowment Fund</i>	<i>Restricted Endowment Fund</i>	<i>Museum Modernization Fund</i>	<i>1986</i>	<i>1985</i>
ASSETS							
Cash:							
Commercial accounts (note 3)	\$ 146,819	258,090	16,110	7,427	84,355	512,801	230,809
Savings accounts and money market funds (note 3) . .	—	691,192	—	4,187	3,417,571	4,112,950	2,614,559
Receivables:							
Research grants (note 2)	—	677,248	—	—	—	677,248	623,826
Accrued interest and dividends receivable	69,892	—	78,046	38,345	—	186,283	205,076
Other	171,724	84,518	4,162	39,320	25,970	325,694	119,992
Prepaid expenses	220,268	65,733	—	269	6,044	292,314	137,403
Investments in marketable securities (note 3) . . .	—	—	16,466,467	3,171,116	—	19,637,583	16,719,263
Real property (note 12)	—	—	1,258,084	808,460	—	2,066,544	2,154,044
Due from other funds	—	422,752	—	422,653	224,215	1,069,620	289,943
<i>Total assets</i>	<i>\$ 608,703</i>	<i>2,199,533</i>	<i>17,822,869</i>	<i>4,491,777</i>	<i>3,758,155</i>	<i>28,881,037</i>	<i>23,094,915</i>
LIABILITIES AND FUND BALANCES							
Liabilities:							
Accounts payable	383,242	175,083	—	1,569	217,350	777,244	433,561
Deferred grant income (note 2)	—	560,047	—	—	—	560,047	599,398
Deferred restricted support (note 4)	—	—	—	—	3,374,939	3,374,939	—
Other liabilities	80,424	200	—	—	—	80,624	69,448
Due to other funds	145,037	—	924,583	—	—	1,069,620	289,943
	608,703	735,330	924,583	1,569	3,592,289	5,862,474	1,392,350
Fund balances:							
Current unrestricted, available for general operations	—	—	—	—	—	—	(57,122)
Current restricted, designated by donors for:							
Research grants	—	121,759	—	—	—	121,759	158,275
Special projects	—	1,342,444	—	—	—	1,342,444	14,792,296
Museum modernization	—	—	—	—	165,866	165,866	1,211,846
Endowment funds, under board discretion.	—	—	16,898,286	4,490,208	—	21,388,494	5,597,270
Fund balances.	—	1,464,203	16,898,286	4,490,208	165,866	23,018,563	21,702,565
Commitments and contingencies (note 13)							
<i>Total liabilities and fund balances</i>	<i>\$ 608,703</i>	<i>2,199,533</i>	<i>17,822,869</i>	<i>4,491,777</i>	<i>3,758,155</i>	<i>28,881,037</i>	<i>23,094,915</i>

See accompanying notes to financial statements.

Statements of Current Funds— General Operating Revenues, Expenses, Transfers and Fund Balance

Years ended 30 June 1986 and 1985

	1986	1985
Operating Income:		
Admissions:		
General (note 9)	\$2,350,272	\$1,548,326
Planetarium	235,575	184,765
Contributions:		
Corporate	69,529	83,769
Foundations	33,857	18,075
Individuals, trusts	220,807	200,000
Memberships	596,877	565,693
Concession Royalties:		
Restaurant	192,518	151,930
Museum store	89,280	82,826
Laser show (net)	67,690	47,101
Tuition and program fees:		
Junior Academy	17,101	15,720
Adult Education	125,090	114,014
International travel	50,000	50,000
City and County of San Francisco support of operations (note 10)	1,571,094	1,454,801
Institute of Museum Services Grant	75,000	50,000
Indirect cost reimbursement from grant contracts	95,003	104,229
Pacific Discovery and publications sales	19,869	18,757
Rental for special events	141,863	70,743
Miscellaneous income	22,205	73,706
Total operating income	<u>5,973,630</u>	<u>4,834,455</u>
Non-operating income:		
Commercial Building rent (net)	686,564	661,183
Endowment Fund interest, dividends	—	394,101
Designated fund allocation (note 1)	1,257,683	—
Total non-operating income	<u>1,944,247</u>	<u>1,055,284</u>
Total revenues	<u>7,917,877</u>	<u>5,889,739</u>
Investment income transfers from Special Purpose Fund	<u>—</u>	<u>1,250,000</u>
Total revenues and transfers	<u>7,917,877</u>	<u>7,139,739</u>
Expenses:		
Administration	274,446	246,357
Research division	1,375,014	1,296,887
Public programs	1,312,423	1,097,414
Aquarium	1,204,355	1,032,133
Development and Membership	474,350	437,316
Support services and building operations	1,475,542	1,356,388
General and allocable costs	1,382,534	1,129,133
Employees' pension annuity (note 7)	117,243	102,567
Investment management fees	34,277	24,090
Capital expenditures	210,571	272,445
Total expenses	<u>7,860,755</u>	<u>6,994,730</u>
Excess of revenues and transfers over expenses	<u>57,122</u>	<u>145,009</u>
Fund balance (deficit) at beginning of year	<u>(57,122)</u>	<u>(202,131)</u>
Fund balance at end of year	<u>\$ —</u>	<u>(57,122)</u>

See accompanying notes to financial statements.

Statements of Changes in Fund Balances

Year Ended 30 June 1986

	Current funds			Endowment Funds			Total All Funds	
	General Operating Fund	Restricted Funds	Special Purpose Fund (note 1)	General Purpose Endowment Fund	Restricted Endowment Fund	Museum Modernization Fund	1986	1985
Balances at beginning of year	\$ (57,122)	158,275	14,792,296	5,597,270	—	1,211,846	21,702,565	18,871,910
Establishment of deferred restricted support (note 1)	—	—	—	—	—	(1,155,794)	(1,155,794)	—
Additions:								
Contributions:								
Corporate	69,529	138,334	—	—	3,000	582	211,445	214,901
Foundations	33,857	300,335	—	10,000	3,111	355,000	702,303	554,313
Individuals, trusts	220,807	189,955	—	361,771	135,357	638,946	1,546,836	2,592,430
Grant Income:								
Federal	75,000	491,718	—	—	—	—	566,718	279,001
State	—	20,542	—	—	—	1,900,000	1,920,542	119,242
Other	—	17,192	—	—	—	—	17,192	92,400
Other operating income	5,240,383	195,028	—	—	—	—	5,435,411	4,232,134
Investment income	1,126,530	86,917	779,411	—	—	113,097	2,105,955	2,214,946
Net gain (loss) on sale of securities	—	—	1,721,677	452,963	—	(3,283)	2,171,357	850,608
Designated fund allocation (note 1)	817,717	—	—	—	—	—	817,717	—
Tuition income	192,191	169,280	—	—	—	—	361,471	344,155
Jane Goodall Institute Funds	—	—	—	—	—	—	—	460,000
Rental income	141,863	41,298	—	—	—	—	183,161	166,293
Other	—	161,973	—	—	26,626	57,763	246,362	198,394
Total additions	7,917,877	1,812,572	2,501,088	824,734	168,094	3,062,105	16,286,470	12,318,817
Deductions:								
Salary expense	4,157,386	336,896	—	234	6,101	167,196	4,667,813	4,250,317
Other operating expenses	2,930,412	415,793	—	2,760	—	—	3,348,965	3,139,092
Indirect costs for research grants	—	95,003	—	—	—	—	95,003	104,253
Amounts expended for furniture, fixtures and equipment (note 11).	102,930	290,242	—	—	9,826	17,026	420,024	501,961
Amounts expended for construction (note 11)	2,270	5,586	—	44,830	—	287,905	340,591	40,495
Amounts expended for professional services	97,089	125,660	—	173,439	1,217	276,720	674,125	451,028
Amounts expended for investment management	34,277	—	103,294	20,949	4,875	—	163,395	145,084
Amounts expended for exhibit installation	96,212	91,081	—	—	—	—	187,293	307,952
Amounts expended for materials and supplies	354,028	268,478	—	—	—	—	622,506	238,926
Amounts deferred for capital campaign (note 4)	—	—	—	—	—	2,219,145	2,219,145	—
Designated fund allocation (note 1)	—	—	—	817,717	—	—	817,717	—
Other	86,151	57,240	—	—	5,540	109,170	258,101	309,054
Total deductions	7,860,755	1,685,979	103,294	1,059,929	27,559	3,077,162	13,814,678	9,488,162
Transfers between funds (note 1)	—	1,179,335	(17,190,090)	11,536,211	4,349,673	124,871	—	—
Balances at end of year	\$ —	1,464,203	—	16,898,286	4,490,208	165,866	23,018,563	21,702,565

See accompanying notes to financial statements.

Accountants' Report

*The Board of Trustees
California Academy of Sciences:*

We have examined the balance sheets of the funds of the California Academy of Sciences as of 30 June 1986 and the related statements of current funds—general operating revenues, expenses, transfers and fund balance for the years ended 30 June 1986 and 1985 and statements of changes in fund balances for the year ended 30 June 1986. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Under generally accepted accounting principles, expenditures for furniture, fixtures and equipment should be capitalized. The California Academy of Sciences charges such purchases to current expenses, the effect of which is more fully described in note 11.

In our opinion, except for the effect on the financial statements of the failure to capitalize expenditures for furniture, fixtures and equipment as discussed in the preceding paragraph, the aforementioned financial statements present fairly the financial position of the California Academy of Sciences at 30 June 1986, the results of its current funds operations for the years ended 30 June 1986 and 1985, and the

changes in its fund balances for the year ended 30 June 1986, in conformity with generally accepted accounting principles which, except for the change, with which we concur, in the method of accounting for contributions in the Museum Modernization Fund as described in note 1, to the financial statements have been applied on a basis consistent with that of the preceding year.

Our examinations were made for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplementary information included in Schedules 1 through 6 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the examinations of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

Peat, Marwick, Mitchell & Co.

*San Francisco, California
September 5, 1986*

Notes to Financial Statements 30 June 1986

1. Summary of Significant Accounting Policies

The California Academy of Sciences Natural History Museum and Aquarium (CAS) uses the accrual method of accounting with revenue recorded when earned and expenses recorded when incurred. Government grants are recognized in full when awarded if the term of the grant is one year or less. Grants applying to several years are deferred with the revenue recognized as related expenditures are incurred.

During the current fiscal year CAS changed its policy for recording capital campaign contributions. Contributions to the capital campaign are recorded in the Museum Modernization Fund and are deferred until expenditures are incurred for the restricted purposes (see note 4). As a result of the change in policy, \$1,155,794 in contributions previously recognized as revenue has been credited to deferred restricted support.

Gifts of specimens and collections are not included in the financial statements.

Pledges are not recorded in the financial statements until received. CAS estimates that approximately \$6 million in pledges are outstanding at June 30, 1986, primarily for the current campaign to renovate and improve CAS exhibits and facilities (see note 4).

Donated materials and services are not recorded.

During the fiscal year ended June 30, 1986, CAS performed an analysis of its fund structure and strategy for portfolio management. As a result of this analysis, funds previously designated as Special Purpose Funds were transferred into Current Restricted Funds, General Purpose Endowment, Restricted Endowments and Museum Modernization. The purpose of the analysis was to enable CAS's investment advisors to better manage the investment portfolio on the basis of total return, to provide for endowment growth, to consistently classify current funds and improve management information for special projects. Subsequent to the change, CAS has the following funds:

a. Current Funds:

1. General Operating Fund:

This current fund accounts for resources used in carrying on the routine operations of CAS in accordance with the limitations of its charter and bylaws. The Board of Trustees (Board) exercises discretionary control over this fund.

2. Current Restricted Funds:

—The current Research Fund accounts for gifts and grants restricted to research projects. Certain of the current General Operating Fund expenditures are also for research. Federal Research Grant Funds are held in a

noninterest-bearing checking account as required by law.

—The Special Projects Fund accounts for resources contributed to CAS for specific purposes other than research projects. The resources are currently available for use, but expendable only for the purposes specified by the donors. Accounts in this fund are designated primarily for special exhibitions, educational programs, publications and other special projects and programs. Special Project Funds are held in a liquid money market fund. Income earned on these funds is credited to the individual project accounts on the basis of average quarterly balances.

b. Endowment Funds:

1. The General Purpose Endowment Fund includes the General Endowment Fund, the William H. Noble Fund, the Sinon Clare Lillis Fund and the Designated Fund. It is comprised of unrestricted gifts and bequests.

Unrestricted gifts in excess of \$25,000 and life memberships in the amount of \$750 are credited to the General Endowment Fund. The William H. Noble Fund and the Sinon Clare Lillis Fund were large bequests. The principal amount of the gifts and bequests in these funds is not maintained intact in perpetuity, but is utilized under the discretion of the Board of Trustees. CAS policy is to maintain the donated capital of the General Purpose Endowment Fund intact in real purchasing terms. The Designated Fund is the excess of the fair market valuation of the General Purpose Endowment Fund over the values of the donated funds plus inflation measured by the increase in the Consumer Price Index. For the year ended 30 June 1986, \$1,257,683 was allocated from the Designated Fund.

2. The Restricted Endowment Fund is comprised of restricted gifts and bequests. Included are gifts and bequests designated primarily for curatorial chairs and departmental endowment funds. Income earned on these funds is generally available for the specified restricted activities. Expenditure of principal is also allowable if not specifically restricted by the donors, and it may be spent with Board action.

c. Museum Modernization Fund:

The Museum Modernization Fund is for resources contributed specifically for construction projects, plant additions, and the general capital renovation of the CAS facilities. Resources received for the current capital campaign are reflected as additions to this fund and maintained in a segregated government-backed money market fund. Deferred restricted support is credited for funds collected for which expenditures have not yet been incurred.

2. Research Grants Receivable and Deferred Grant Revenue

Grants receivable represent amounts pledged to CAS for certain operations and for the completion of designated research and exhibit projects in future years. The grants are collected when expenditures are made for the designated project. A summary of grants receivable follows:

National Endowment for the Arts	\$ 16,932
National Science Foundation	629,774
Other	30,542
	<u>\$677,248</u>

A summary of activity in deferred grant revenue follows:

Deferred grant revenue beginning of year	\$599,398
Additional grants	427,002
Expenditures	466,353
	<u>\$560,047</u>

3. Cash and Investments in Marketable Securities

Cash and Equivalents

Cash and equivalents are invested in commercial accounts, savings accounts and money market funds detailed as follows:

Commercial Bank Accounts	\$ 512,801
Dreyfus Liquid Assets Fund	686,504
Dreyfus Government Institutional Fund	3,417,571
Savings Accounts	8,875
	<u>\$4,625,751</u>

Marketable Securities

Securities are recorded at the lower of aggregate cost or market in accordance with generally accepted accounting principles. If acquired by gift, a security is recorded at the fair market value at the date of acquisition. At 30 June 1986, the book value and net unrealized gains pertaining to the marketable securities portfolios were as follows:

	<i>Book value</i>	<i>Market value</i>	<i>Net unrealized gain</i>
General Purpose Endowment Fund:			
<i>Bonds and cash equivalents</i>	\$ 7,173,516	7,739,499	565,983
<i>Stocks</i>	9,292,951	13,680,054	4,387,103
	<u>\$16,466,467</u>	<u>21,419,553</u>	<u>4,953,086</u>
Restricted Endowment Fund:			
<i>Bonds and cash equivalents</i>	1,700,274	1,854,802	154,528
<i>Stocks</i>	1,470,842	2,231,137	760,295
	<u>\$3,171,116</u>	<u>4,085,939</u>	<u>914,823</u>

4. Capital Campaign

The California Academy of Sciences has embarked on a \$37 million capital campaign to improve the quality of science education and research. Gifts provided for future capital projects are treated as deferred restricted support. As expenditures are incurred for the restricted purposes of the gifts, deferred restricted support is credited to revenue. Activity recorded in deferred restricted support is summarized as follows:

Balance at beginning of year	\$ -
Establishment of deferred restricted support (note 1)	1,155,794
Contributions and transfers	3,077,162
	<u>4,232,956</u>
Deductions—funds expended during the year	858,017
Balance at end of year	<u>\$3,374,939</u>

5. Buildings

The buildings acquired by CAS in Golden Gate Park are not reflected in the accompanying balance sheets since, under the terms of the Charter of the City and County of San Francisco (City), no one other than the City may hold title to buildings on City property. As the CAS facilities in Golden Gate Park are acquired, title is transferred to the City. The buildings were valued at \$22,800,000 by the latest insurance appraisal in 1982.

6. Collections, Library and Equipment

Collections, library and equipment are expensed in the year of acquisition and, as such, are not reflected in the accompanying balance sheets. CAS staff have estimated the replacement cost of collections, library, and equipment to be well in excess of \$20,000,000.

7. Employees' Pension Annuity

On 1 January 1964, CAS adopted a pension plan utilizing individual annuity contracts for all regular staff members who work in excess of 1,000 hours per year. This plan has been amended to be in compliance with the Employee Retirement Income and Security Act of 1974, the Tax Equity and Fiscal Responsibility Act of 1982, the Deficit Reduction Act of 1984, and the Retirement Equity Act of 1985.

Under the provisions of the plan, CAS and its eligible employees each contribute an amount equal to five percent of the amount of salary subject to Social Security tax and seven and one half percent of the amount of salary above the Social Security tax base. Total pension expense was \$117,243 and \$102,567 for 1986 and 1985, respectively.

8. Trusts

CAS is the ultimate beneficiary under an irrevocable living trust in the amount of \$240,843 (market value \$374,505). The income of the trust is paid to the grantors and CAS bears the cost of all trust operations. The assets of the trust are not shown in the accompanying financial statements.

CAS is the trustee and beneficiary under four irrevocable unitrust agreements which, together, had a market value at 30 June 1985 of \$2,543,706. CAS is a fifty percent beneficiary under two of the agreements and is the sole beneficiary under the remaining two agreements. Each grantor receives an annual amount equal to a stated percentage of the net fair market value of the assets of the respective unitrust, except for one grantor who receives a stated percentage of the net fair market value of the assets or current income, whichever is less. The percentages range from five to eight percent. These trusts absorb the costs of their operations. The assets of the trusts are not shown in the accompanying financial statements. Distributions to grantors under the unitrust agreements, for the fiscal year ended 30 June 1986, totaled \$135,748.

In 1983, CAS was named ultimate beneficiary of a Pooled Income Fund with a market value at 30 June 1986 of \$189,252. The assets of the fund are not shown in the accompanying financial statements.

9. Admissions Revenue

General admissions revenue increased to \$2,350,272 in the fiscal year ended 30 June 1986 from \$1,548,326 for the year ended 30 June 1985 through a combination of an increased number of visitors and increased admission fees. A detail of fees and attendance follows:

	<i>1986</i>	<i>1985</i>
Admission fees:		
Adult	\$ 3.00	\$ 2.00
Youths and seniors	1.50	1.50
Children	0.75	0.75
Organized groups	0.50	0.50
Attendance:		
Adult	685,325	657,099
Youths and seniors	109,132	106,935
Children	104,097	101,887
Organized groups	106,864	108,153
Total	<u>1,005,418</u>	<u>974,074</u>

10. City and County of San Francisco Support of Operations

Section 6.404d of the Charter of the City and County of San Francisco states that the City shall provide funds necessary for the maintenance of the Steinhart Aquarium and funds deemed proper for the maintenance of the Golden Gate Park buildings. During the fiscal years ended 30 June 1986 and 1985, CAS received \$1,571,094 and \$1,454,801 respectively, from the City and County of San Francisco for this support.

In addition to its annual support, in the fiscal year ended 30 June 1985, the the City allocated \$2.0 million to reroof the Golden Gate Park complex and to seismically upgrade the 1910 North American Hall. These construction projects may take up to three years to complete. These expenses and related support are not included in the financial statements as they do not represent annual ongoing support from the City and County of San Francisco.

11. Furniture, Fixtures and Equipment

CAS departs from generally accepted accounting principles in that it expenses furniture, fixtures and equipment as acquired rather than capitalizing them and depreciating the costs over the useful lives thereof. During 1986 and 1985, CAS acquired furniture, fixtures and equipment costing \$420,024 and \$501,961, respectively. CAS also expended \$340,591 in 1986 and \$40,495 in 1985 for commercial building improvements (note 12) which were not capitalized.

12. Real Property

CAS owns an eleven-story, fully depreciated commercial building located in the City of San Francisco. The value of \$608,084 recorded on the balance sheet of the General Purpose Endowment Fund represents the cost of the land. The building was valued in excess of \$12,000,000 by an appraisal in December of 1982.

In 1982 CAS received a bequest consisting primarily of a residence in San Francisco, California, valued at \$650,000. The bequest has been recorded in the General Purpose Endowment Fund. The house is currently the Executive Director's residence.

In 1979, CAS received title to 3,117 acres of ranchland in Sonoma County known as Pepperwood Ranch Natural Preserve. CAS, under the terms of the grant deed of title, must preserve the property in its current natural state and can utilize the property for research and educational activities for a period of at least ten years. The value as recorded on the balance sheet of the Restricted Endowment Fund represents the assessed value of the property on the date of the gift of \$808,460.

13. Commitments and Contingencies

CAS is involved in various claims and legal actions arising in the ordinary course of its operations. In the opinion of management, the ultimate disposition of all legal matters will not have a material adverse effect on CAS's financial condition.

14. Income Taxes

CAS is qualified as a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code and is not a private foundation. CAS is also a public-benefit tax-exempt corporation under the laws of the State of California.

15. Total Columns

Total columns on the balance sheets and statements of changes in fund balances are presented to aggregate financial data. Data in these columns do not present financial position, results of operations, or changes in financial position in conformity with generally accepted accounting principles. Neither is such data comparable to a consolidation. Interfund eliminations have not been made in the aggregation of this data.

Schedule of Expenditures for the Research Division

Year ended 30 June 1986 with comparative figures for 1985

Research and curatorial expenditures:

Department	General Operating Fund	
	1986	1985
Anthropology	\$ 54,425	89,822
Botany	177,993	179,771
Entomology	222,123	221,031
Herpetology	123,517	101,077
Ichthyology	130,541	132,256
Invertebrate Zoology & Geology	258,692	244,412
Ornithology & Mammalogy	99,496	93,827
Library	166,936	164,382
Picture Collection	28,544	27,316
Publications	26,292	20,258
Other research	86,455	22,735
	<u>\$1,375,014</u>	<u>1,296,887</u>

Schedule of Expenditures for the Public Programs Division

Year ended 30 June 1986 with comparative figures for 1985

	General Operating Fund	
	1986	1985
Public programs administration	\$ 83,054	80,501
Planetarium	247,400	212,492
Exhibits and cabinet shop	509,604	506,760
Exhibits production	49,560	-
Special exhibits	99,970	-
Photography	49,019	52,923
Education/Junior Academy	100,675	92,336
Adult education	125,657	109,776
Volunteer services	47,484	42,626
	<u>\$1,312,423</u>	<u>1,097,414</u>

Schedule of Expenditures for Support Services and Building Operations

*Year ended 30 June 1986
with comparative figures for 1985*

Schedule of General and Allocable Costs

*Year ended 30 June 1986
with comparative figures for 1985*

	<i>General Operating Fund</i>			<i>General Operating Fund</i>	
	<i>1986</i>	<i>1985</i>		<i>1986</i>	<i>1985</i>
Admissions	\$ 84,870	83,924	Insurance	\$ 429,486	338,173
Business office	266,587	224,691	Telephone	58,983	52,960
Instrument shop	112,399	109,233	Utilities	180,179	193,261
Security	219,366	216,177	Postage	57,868	53,813
Janitorial	241,179	253,130	Professional services	60,179	75,151
Public Information	124,396	130,406	Employer taxes	288,356	279,538
Pacific Discovery	228,619	205,239	Annual report	21,149	18,551
Personnel	135,203	41,671	Employee recreation, training and other	28,863	13,230
Building operations	62,923	91,917	Computer support	58,234	24,870
	<u>\$1,475,542</u>	<u>1,356,388</u>	Automobile gas and maintenance	12,596	14,993
			Director's discretionary costs	35,526	—
			Trustees' Account	17,420	9,562
			Miscellaneous	133,695	55,031
				<u>\$1,382,534</u>	<u>1,129,133</u>

Combining Balance Sheet Current Restricted Funds

30 June 1986

	<i>Research Fund</i>	<i>Special Projects Fund</i>	<i>Total</i>
ASSETS			
Cash:			
Commercial accounts	\$ 38,441	219,649	258,090
Savings accounts and money market funds	—	691,192	691,192
Receivables:			
Research grants	677,248	—	677,248
Other	—	84,518	84,518
Prepaid expenses	10,876	54,857	65,733
Due from other funds	(20,623)	443,375	422,752
Total assets	<u>\$705,942</u>	<u>1,493,591</u>	<u>2,199,533</u>
LIABILITIES AND FUND BALANCES			
Liabilities:			
Accounts payable	24,136	150,947	175,083
Deferred grant income	560,047	—	560,047
Other liabilities	—	200	200
	<u>584,183</u>	<u>151,147</u>	<u>735,330</u>
Fund balances:			
Current restricted, designated by donors for:			
Research grants	121,759	—	121,759
Special projects	—	1,342,444	1,342,444
Fund balances	<u>121,759</u>	<u>1,342,444</u>	<u>1,464,203</u>
Total liabilities and fund balances	<u>\$705,942</u>	<u>1,493,591</u>	<u>2,199,533</u>

Combining Statement of Changes in Fund Balances

Current Restricted Funds

Year Ended 30 June 1986

	<i>Research Fund</i>	<i>Special Projects Fund</i>	<i>Total</i>
Balances at beginning of year	\$158,275	—	158,275
Additions			
Contributions:			
Corporate	12,568	125,766	138,334
Foundations	61,100	239,235	300,335
Individuals, trusts	17,480	172,475	189,955
Grant Income:			
Federal	491,718	—	491,718
State	20,542	—	20,542
Other	—	17,192	17,192
Investment income	6,367	80,550	86,917
Net gain on sale of securities	—	—	—
Other operating income	—	195,028	195,028
Tuition income	—	169,280	169,280
Rental income	—	41,298	41,298
Other	18,561	143,412	161,973
Total additions	628,336	1,184,236	1,812,572
Deductions:			
Salary expense	199,254	137,642	336,896
Other operating expenses	162,438	253,355	415,793
Expenditures of research grants	95,003	—	95,003
Amounts expended for furniture, fixtures and equipment	196,711	93,531	290,242
Amounts expended for construction	1,400	4,186	5,586
Amounts expended for professional services	10,046	115,614	125,660
Amounts expended for investment management	—	—	—
Amounts expended for exhibit installation	—	91,081	91,081
Amounts expended for materials and supplies	—	268,478	268,478
Other	—	57,240	57,240
Total deductions	664,852	1,021,127	1,685,979
Transfers between funds	—	1,179,335	1,179,335
Balances at end of year	\$121,759	1,342,444	1,464,203

Schedule of Multiple Year Research Grants

30 June 1986

	<i>Cumulative Grant Award</i>	<i>Prior Years Grant Expenditures</i>	<i>Current Year Grant Expenditures</i>	<i>Deferred Grant Income</i>
National Science Foundation:				
Botany Department				
<i>Support for Care and Use of the Systematic Collections of Botany</i>	\$ 228,900	131,875	74,424	22,601
<i>U.S.-China Cooperative Research</i>	48,206	20,014	24,583	3,609
Entomology Department				
<i>Support for the Systematic Collections of Entomology</i>	451,000	347,392	80,413	23,195
Ichthyology Department				
<i>Support for the Collection of Fishes</i>	375,117	291,876	56,862	26,379
<i>Nominal Genera and Species of Fishes</i>	42,450	11,635	15,660	15,155
Invertebrate Zoology Department				
<i>Support for a Major Systematic Collection of Recent Mollusks</i>	150,000	118,392	31,608	—
<i>Compacterization of the Biological Research Collections</i>	355,000	159,239	54,591	141,170
<i>Computerization of Invertebrate Zoology and Geology Collections</i>	107,000	—	25,098	81,902
Ornithology and Mammalogy Department				
<i>Computerization of a Major Ornithology Collection</i>	199,255	13,615	103,114	82,526
Exhibits Department				
<i>Life Through Time—The Impact of Evolution</i>	149,830	—	—	149,830
Total National Science Foundation	2,106,758	1,094,038	466,353	546,367
National Endowment for Arts:				
Anthropology Department				
<i>Coptic Textiles Catalog</i>	25,000	11,320	—	13,680
Total Multiple Year Research Grants	\$2,131,758	1,105,358	466,353	560,047

Schedule of Special Projects Funds

30 June 1986

The following accounts, which comprise the Special Projects Fund were created by donors who gave gifts to CAS restricted to support special programs, projects, and exhibits:

	<u>Fund Balance</u>		<u>Fund Balance</u>
For Research Activities:		For Public Program Activities:	
Anthropology Department		Planetarium Department	
<i>Reitz Food Technology Foundation Fund</i>	\$ 60,861	<i>Planetarium Remodeling Fund</i>	30,335
<i>Elkus Collection Fund</i>	11,629	<i>Pendulum Revolving Fund</i>	7,401
<i>Gifts—Anthropology</i>	7,296	Exhibits Department	
Botany Department		<i>Gary Larson</i>	1,380
<i>Botany Expedition Fund</i>	9,951	<i>Life Long Safari</i>	19,835
<i>Friedman Costa Rica Account</i>	5,638	<i>Life Through Time Hall</i>	4,663
<i>Gifts—Botany</i>	14,582	<i>Wattis Hall Fund</i>	15,014
Entomology Department		<i>Barrett Hindes Memorial Fund</i>	15,704
<i>Entomology Publications</i>	2,231	<i>Earth and Space Science Hall Renovation</i>	7,719
Herpetology Department		<i>Stephens Horological Fund</i>	1,597
<i>Gifts—Herpetology</i>	34,232	<i>Great Central Valley Project</i>	4,478
Ichthyology Department		Education Department	
<i>W. Follett Fund</i>	3,172	<i>San Francisco Foundation</i>	7,122
<i>Gifts—Ichthyology</i>	19,359	<i>Youth Guides</i>	3,358
Invertebrate Zoology and Geology Department		<i>Life Long Safari</i>	9,270
<i>A. G. Smith Memorial Fund</i>	3,268	<i>Life Through Time Programs</i>	58,048
<i>MacArthur Foundation Grant (Michael Ghiselin)</i>	12,103	<i>Traditional Arts Program</i>	10,305
<i>Office Remodeling and Fire Safety Upgrade</i>	109,522	<i>Docents Fund</i>	5,058
<i>G. Dallas Hanna Memorial Fund</i>	11,299	<i>Symposia Revolving Fund</i>	6,837
<i>Gifts—Invertebrate Zoology and Geology</i>	11,159	<i>Gifts—Junior Academy</i>	27,261
<i>Gifts—Mineralogy</i>	3,305		<u>235,385</u>
<i>Gifts—Paleobiology</i>	482	For Aquarium Activities:	
Ornithology and Mammalogy Department		<i>Dolphin Tank Renovation Fund</i>	23,317
<i>Gifts—Ornithology and Mammalogy</i>	18,688	<i>Coral Reef Display</i>	25,437
Library Department			<u>48,754</u>
<i>Library Duplicate Book Sales</i>	20,738	For Other Academy Activities:	
<i>Gifts—Library</i>	25,394	<i>Fun Run</i>	29,541
Picture Collection Department		<i>Science in Action Radio Program</i>	41,722
<i>Gifts—Picture Collections</i>	27,457	<i>Jane Goodall Institute Accounts</i>	217,454
Research Director's Fund		<i>Donald Patterson Bequest</i>	1,727
<i>Scanning Electron Microscope Support</i>	1,699	<i>Pepperwood Revolving Fund</i>	57,442
Scientific Publications Department		<i>Hanan Revolving Fund</i>	15,097
<i>Flora of Chiapas</i>	5,986	<i>Allen D. Christensen Fund</i>	22,408
<i>Gifts—Publications</i>	136,246	<i>Pepperwood Master Plan Fund</i>	345
Pacific Discovery	6,302	<i>Kathryn C. Kendrick Memorial Fund</i>	16,755
Tilton Post-Doctorate Fellowship Fund	46,116	<i>William Hewlett Fund</i>	12,590
	<u>608,715</u>	<i>Membership Campaign Revolving Fund</i>	44,657
		<i>Wilson and Mabel Meyer Memorial Fund</i>	7,524
		<i>Morrison Auditorium Refurbishing Fund</i>	(11,657)
		<i>Fellows Research Fund</i>	926
		<i>Great Barrier Reef Book Revolving Fund</i>	(2,445)
		<i>Museum Store Investment</i>	(5,935)
			<u>448,151</u>
		All other under \$1,000	1,439
		Total	<u><u>\$1,342,444</u></u>

Schedule of General Purpose
Endowment Fund

30 June 1986

The following accounts, which comprise the General Purpose Endowment Fund, are the accumulation of unrestricted gifts over \$25,000 and the dues from Life Members. A portion of the Designated Fund is made available by the Finance Committee annually to support Academy operations. The Designated Fund represents the excess total return on the managed investment portfolios over the donor contributions to the unrestricted endowment fund. The purchasing power of donor contributions, is maintained through earnings credits based partially on the increases in the consumer price index. Balances are based at Fair Market Value of the securities held in the portfolios:

<i>General Endowment Fund</i>	\$ 6,509,511
<i>William H. Noble Fund</i>	5,565,596
<i>Sinon Clare Lillis Fund</i>	2,844,581
<i>Designated Fund</i>	6,499,865
<i>General Purpose Endowment Fund</i>	<u>\$21,419,553</u>

Schedule of Restricted
Endowment Funds

30 June 1986

	<i>Fund Balance</i>
For Research Activities:	
Anthropology Department	
<i>Irvine Anthropology Chair</i>	\$ 944,965
Botany Department	
<i>Hiram Bloomer Memorial Fund</i>	38,742
<i>Botany Endowment Fund</i>	133,476
<i>Decker and Martha McAllister Botany Chair</i>	170,732
<i>John T. Howell Botany Chair (partial)</i>	164,901
<i>L. Rose Memorial Fund</i>	27,786
Entomology Department	
<i>Dr. Harriet Exline Frizzell Fund for Arachnid Research</i>	164,826
<i>Entomology Endowment Fund</i>	134,084
<i>Owen Bryant Memorial Fund</i>	45,314
<i>Edwin Cooper Van Dyke Fund</i>	41,895
Invertebrate Zoology and Geology Department	
<i>Magnus Vonsen Mineral Fund</i>	43,681
<i>Rollie and May Ada Henley Fund</i>	31,632
Ornithology and Mammalogy Department	
<i>Augsbury Fund</i>	13,330
G. Lindsay Scholarship Fund for Field Research	114,021
	<u>2,069,385</u>
For Public Program Activities:	
Planetarium Department	
<i>Charles M. Goethe Planetarium Fund</i>	142,940
<i>B. D. Dean Memorial Fund</i>	43,836
Education Department	
<i>Charles M. Goethe Endowment Fund for the Junior Academy</i>	713,917
<i>Claire M. Lilienthal Memorial Lecture Series</i>	71,434
<i>Discovery Room</i>	10,521
	<u>982,648</u>
For Aquarium Activities:	
<i>Aquatic Biology Fund</i>	95,188
<i>Penguin Environment</i>	21,241
<i>E. S. Herald Aquarium Books</i>	(9,438)
	<u>106,991</u>
For Other Academy Activities:	
<i>Pepperwood Ranch</i>	808,460
<i>Pepperwood Ranch Operating Fund</i>	73,680
<i>Geraldine K. Lindsay Memorial Fund</i>	115,354
<i>Fellows Research Fund</i>	4,950
<i>Goodall Primate Research Fund</i>	328,740
	<u>1,331,184</u>
	<u>\$4,490,208</u>

Schedule of Comparative Five-Year Data General Operating Fund

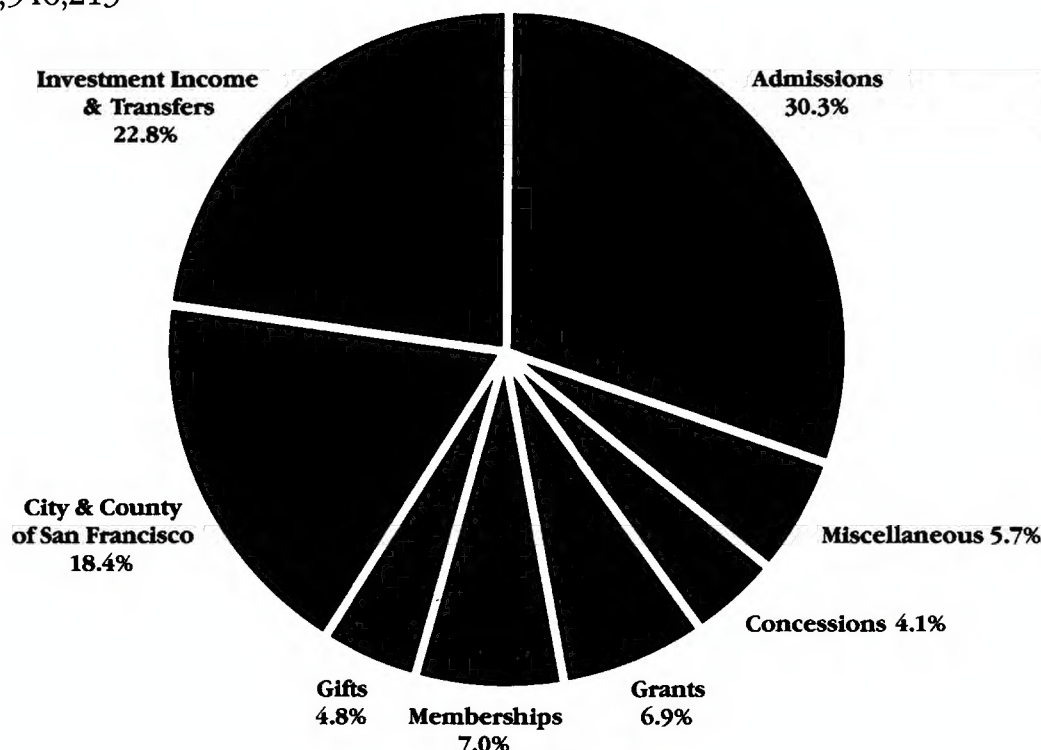
(in thousands)

	Year ended 30 June				
	1986	1985	1984	1983	1982
Revenues:					
Admissions	\$ 2,586	1,733	1,801	1,627	1,178
Memberships	597	566	448	436	307
City and County of San Francisco	1,571	1,455	1,061	963	886
Other	1,219	1,080	933	788	1,037
Total operating income	5,973	4,834	4,243	3,814	3,408
Investment income:					
Commercial Building rent (net)	687	661	610	523	445
Endowment Earnings, allocations and transfers	1,258	1,644	1,124	1,013	589
	1,945	2,305	1,734	1,536	1,034
Total revenues	7,918	7,139	5,977	5,350	4,442
Expenses:					
Administration and general	3,969	3,568	2,973	2,716	1,950
Research	1,375	1,296	1,158	1,123	916
Public Programs and Aquarium	2,517	2,130	1,865	1,617	1,653
Total expenses	7,861	6,994	5,996	5,456	4,519
Excess of expenses over revenues and investment income transfers	57	145	(19)	(106)	(77)
Fund balance (deficit) at beginning of year	(57)	(202)	(183)	(77)	-
Fund balance (deficit) at end of year	\$ -	(57)	(202)	(183)	(77)
Managed investment portfolio comparisons:					
Book value of securities	\$19,638	16,719	15,109	13,448	13,428
Market value of securities	25,505	20,174	15,751	15,973	12,950

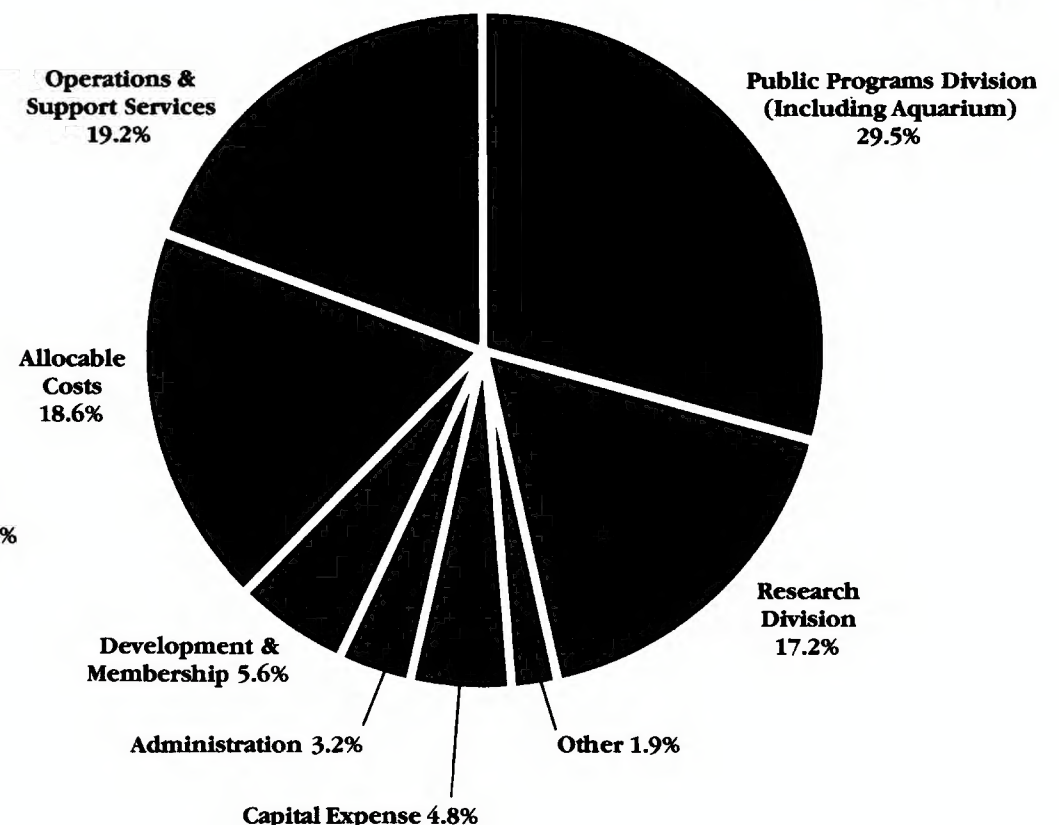
General Operating and Research Funds

for year ended 30 June 1986

Income and Transfers
\$8,546,213



Expenditures
\$8,525,607



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